

Transmittal Letter to the United States
Designated/Elected Office (DO/EO/US)Prepared from
FORM PTO-1390

09/936753

Attorney's Docket No. : A20-029
 U.S. Application No. : Not yet assigned
 International Application No. : PCT/AU00/00212
 International Filing Date. : 17 March 2000 (17.03.00)
 Priority Date Claimed : 17 March 1999 (17.03.99)
 Title of Invention : Surface Finishing Machine
 Applicant(s) for (DO/EO/US) : RILEY, James and MCNAIR, Susan

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures [35 U.S.C. 371 (f)] at any time rather than delay examination until the expiration of the applicable time limit set forth in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed [35 U.S.C. 371(c)(2)]
 - a) ☐ is transmitted herewith (required only if not transmitted by the International Bureau)
 - b) ☒ has been transmitted by the international Bureau
 - c) ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English [35 U.S.C. 371(c)(2)]
7. ☐ Amendments to the claims of the International Application under PCT Article 19 [35 U.S.C. 371(c)(3)]
 - a) ☐ are transmitted herewith (required only if not transmitted by the International Bureau)
 - b) ☐ have been transmitted by the International Bureau
 - c) ☐ have not been made; however, the time limit for making such amendments has **NOT** expired.
 - d) ☐ have not been made and will not be made
8. ☐ A translation of the amendments to the claims under PCT Article 19 [35 U.S.C. 371(c)(3)]
9. ☒ An oath or declaration of the inventor(s) [35 U.S.C. 371(c)(4)]
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 [35 U.S.C. 371(c)(5)]

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98, and 5 References
12. ☐ An Assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. ☒ A **FIRST** preliminary amendment
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment
14. ☒ A substitute specification (International Publication No. WO 00/52593)
15. ☐ A change of power of attorney and/or address letter
16. ☒ (other items or information) PCT Request Form (PCT/RO/01); Form PCT/IB/308; Form PCT/IB/332; Form PCT/IPEA/409

EXPRESS MAIL No.: EL 890534229 Deposited: September 17, 2001

I hereby certify that this correspondence is being deposited with the United States Postal Service Express mail under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, DC 20231.

R. Neil Sudol

September 17, 2001
Date

17. X The following fees are submitted:

BASIC NATIONAL FEE [37 CFR 1.492(a)(1)-(5)]:

Search Report has been prepared by the EPO or JPO \$ 860.00
International preliminary examination fee paid to USPTO [37 CFR 1.482] \$ 690.00
No International preliminary examination fee paid to USPTO [37 CFR 1.482] but International search fee paid to USPTO [37 CFR 1.445(a)(2)] \$ 710.00
X Neither International preliminary examination fee [37 CFR 1.482] nor International search fee [37 CFR 1.445(a)(2)] paid to USPTO \$ 1000.00
International preliminary examination fee paid to USPTO [37 CFR 1.482] and all claims satisfied provisions of PCT Article 33(1)-(4) \$ 100.00

ENTER APPROPRIATE BASIC FEE AMOUNT

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JC96 Rec'd PCT/PTO SEP 17 2001

Surcharge of \$130.00 for furnishing the oath or declaration later than 20 X 30 months from the earliest claimed priority date [37 CFR 1.492(e)]

Claims	Number filed	Number extra	Rate
Total Claims	31 - 20 =	11 x	\$ 18. = \$ 198.00
Indep. Claims	3 - 3 =	0 x	\$ 80 = \$
Multiple Dependent Claim(s) (if applicable) + \$ 260. = \$			
TOTAL OF ABOVE CALCULATIONS = \$1198.00			

Reduction by $\frac{1}{2}$ for filing by small entity, if applicable.
Verified Small Entity Statement must be filed.
[Note 37 CFR 1.9, 1.27, 1.28]

SUBTOTAL = \$ 599.00

Processing fee of \$130.00 for furnishing the English Translation later than 20 X 30 months from the earliest claimed priority date [37 CFR 1.492(f)]

TOTAL NATIONAL FEE = \$

Fee for recording the enclosed assignment [37 CFR 1.21(h)]
The assignment must be accompanied by an appropriate cover sheet [37 CFR 3.28, 3.31]. \$40.00 per property

TOTAL FEES ENCLOSED = \$ 599.00

(AMOUNTS TO BE REFUNDED OR CHARGED)	REFUNDED	\$
	CHARGED	\$

a) V A check in the amount of **\$599.00** to cover the above fees is enclosed.

b) - Please charge my Deposit Account No. 04-0838 in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.

c) V The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 04-0838. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 36 CFR 1.494 or 1.495 has not been met, a petition to revive [37 CFR 1.137(a) or (b)] must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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Coleman Sudol Sapone, P.C.
714 Colorado Avenue
Bridgeport, CT 06605-1601
Tel. (203) 366-3560

R. Neil Sudol
Name

Signature

31,669
Reg. No.

September 17, 2001
Date

Applicant/Patentee : James Francis Riley and Susan Gail McNair
Serial/Patent No. : Not Yet Assigned
Filed/Issued : Herewith
For : Surface Finishing Machine
Attorney's Docket No. : A20-029

INDEPENDENT INVENTORS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. 1.9(f) AND 1.27(b)) - INDEPENDENT INVENTORS

As the below named inventors, we hereby declare that we qualify as independent inventors as defined in 37 C.F.R. 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled SURFACE FINISHING MACHINE described in

- a) ☐ the specification filed herewith.
b) ☒ application serial no. PCT/AU00/00212, filed 17th March 2000
c) ☐ patent no. _____, issued _____

We have not assigned, granted, conveyed or licensed and are under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

Each person, concern or organization to which we have assigned, granted, conveyed, or licensed or are under obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- a) ☒ no such person, concern, or organization
b) ☐ persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities.
(37 C.F.R. 1.27)

NAME _____

ADDRESS _____

a) ☐ INDIVIDUAL b) ☐ SMALL BUSINESS CONCERN c) ☐ NONPROFIT ORGANIZATION

We acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. 1.28(b)).

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAMES JAMES FRANCIS RILEY and SUSAN GAIL MCNAIR

ADDRESS 21 Shepherd Street, Ridgehaven, South Australia 5097, Australia

SIGNATURE

JAMES FRANCIS RILEY

SUSAN GAIL MCNAIR

DATE

3/9/01

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IN THE UNITED STATES RECEIVING OFFICE (RO/US)

APPLICANT(S) : James Francis RILEY and Susan Gail McNAIR
SERIAL NO. : Not yet assigned
FILED : Herewith
INT'L APPLN NO. : PCT/AU00/00212
INT'L FILING DATE: 17 March 2000
TITLE : Surface Finishing Machine

Commissioner For Patents
Box PCT
Washington, D.C. 20231

Preliminary Amendment

S I R:

Prior to calculation of the filing fee in the above-identified application, please amend the application as follows.

IN THE CLAIMS:

Amend claim 6 as follows:

6. (Once amended) A mounting plate as in claim 1 being adapted to be driven by a random orbital means.

Amend claim 7 as follows:

7. (Once amended) A mounting plate as in claim 1 wherein the center of the mounting plate is part of the web.

Amend claim 11 as follows:

11. (Once amended) A mounting plate as in claim 7 including a plurality of vacuum ports, at least one vacuum port being through the web and proximal to the center of the mounting plate, and other vacuum ports being through the web and proximal to the periphery of the mounting plate.

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Amend claim 12 as follows:

12. (Once amended) A mounting plate as in claim 7 including a plurality of vacuum ports, at least one vacuum port being through each mounting area being adapted to align with a dust extraction aperture of a surface finishing pad.

Amend claim 14 as follows:

14. (Once amended) A mounting plate as in claim 1 wherein each mounting area has at least one channel therein adapted to direct dust to the vacuum port or a one of the vacuum ports through the respective mounting area.

Amend claim 15 as follows:

15. (Once amended) A mounting plate as in claim 1 wherein the mounting areas are circular and of diameter less than or equal to 373mm.

Amend claim 16 as follows:

16. (Once amended) A mounting plate as in claim 1 including hook and loop means adapted for attaching a surface finishing pad to each mounting area on the mounting plate.

Amend claim 17 as follows:

17. (Once amended) A mounting plate as in claim 1 comprising a plurality of layers between an external surface upon which the mounting areas lie and a rear surface, and the mounting plate including a first layer including the mounting areas made of urethane and a second layer of resilient material.

Amend claim 18 as follows:

18. (Once amended) A mounting plate as in claim 1 wherein the vacuum port or at least one of the vacuum ports fits over a hollow cylindrical dust extraction peg, the dust extraction peg having an external circumferential groove, and the mounting plate including a thin backing plate with a peg aperture of diameter slightly smaller than the external diameter of the peg and adapted to receive the dust extraction peg, and the thickness and resiliency of the backing plate being such that the mounting plate may be pushed onto and pulled off the dust extraction peg and when secured relative to the dust extraction peg the backing plate resides within the groove.

Amend claim 22 as follows:

22. (Once Amended) A surface finishing machine as in claim 20 including vacuum dust extraction means adapted to facilitate vacuum dust extraction through respective vacuum ports on the mounting plate.

Amend claim 26 as follows:

26. (Once Amended) A surface finishing machine as in claim 20 including a base plate connected to the random orbital drive means and adapted to receive the mounting plate.

REMARKS

The present Amendment is submitted to eliminate improper multiple dependencies and to reduce the filing fee for the instant application.

Respectfully submitted,
COLEMAN SUDOL SAPONE, P.C.

Dated: September 13, 2001

By: 

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APPENDIX TO PRELIMINARY AMENDMENT
AMENDED CLAIMS IN U.S. NATIONAL PHASE OF PCT/AU00/00212

6. (Once amended) A mounting plate as in [any one of claims 1 to 5 inclusive] claim 1 being adapted to be driven by a random orbital means.

7. (Once amended) A mounting plate as in [any one of claims 1 to 6 inclusive] claim 1 wherein the center of the mounting plate is part of the web.

11. (Once amended) A mounting plate as in [any one of claims 7 to 10 inclusive] claim 7 including a plurality of vacuum ports, at least one vacuum port being through the web and proximal to the center of the mounting plate, and other vacuum ports being through the web and proximal to the periphery of the mounting plate.

12. (Once amended) A mounting plate as in [any one of claims 7 to 11 inclusive] claim 7 including a plurality of vacuum ports, at least one vacuum port being through each mounting area being adapted to align with a dust extraction aperture of a surface finishing pad.

14. (Once amended) A mounting plate as in [any one of claims 1 to 13 inclusive] claim 1 wherein each mounting area has at least one channel therein adapted to direct dust to the vacuum port or a one of the vacuum ports through the respective mounting area.

15. (Once amended) A mounting plate as in [any one of claims 1 to 14 inclusive] claim 1 wherein the mounting areas are circular and of diameter less than or equal to 373mm.

16. (Once amended) A mounting plate as in [any one of claims 1 to 15 inclusive] claim 1 including hook and loop means adapted for attaching a surface finishing pad to each mounting area on the mounting plate.

17. (Once amended) A mounting plate as in [any one of claims 1 to 16 inclusive] claim 1 comprising a plurality of layers between an external surface upon which the mounting areas lie and a rear surface, and the mounting plate including a first layer including the mounting areas made of urethane and a second layer of resilient material.

18. (Once amended) A mounting plate as in [any one of claims 1 to 17 inclusive] claim 1 wherein the vacuum port or at least one of the vacuum ports fits over a hollow cylindrical dust extraction peg, the dust extraction peg having an external circumferential groove, and the mounting plate including a thin backing plate with a peg aperture of diameter slightly smaller than the external diameter of the peg and adapted to receive the dust extraction peg, and the thickness and resiliency of the backing plate being such that the mounting plate may be pushed onto and pulled off the dust extraction peg and when secured relative to the dust extraction peg the backing plate resides within the groove.

Amend claim 22 as follows:

22. (Once Amended) A surface finishing machine as in [either] claim 20 [or 21] including vacuum dust extraction means adapted to facilitate vacuum dust extraction through respective vacuum ports on the mounting plate.

Amend claim 26 as follows:

26. (Once Amended) A surface finishing machine as in [either] claim 20 [or 25] including a base plate connected to the random orbital drive means and adapted to receive the mounting plate.

Substitute Specification and Claims

for

International Application Number PCT/AU00/00212

TITLE:

Surface Finishing Machine

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SURFACE FINISHING MACHINE

FIELD OF THE INVENTION

The invention disclosed herein relates to a surface finishing machine. It also
5 relates to surface finishing pads for use with the surface finishing machine. The
surface finishing machine may be used for sanding, burnishing, polishing and the
like of surfaces such as timber, stone, acrylic and the like. The surface may be,
amongst others, bench tops and floors. Without intending to limit the invention
the application of finishing a solid surface, that is, an acrylic bench top will be
10 used as explanative of the invention. It will be appreciated that the invention is
applicable to other applications and other surfaces.

The processes of sanding, burnishing, polishing and the like of surfaces is
collectively referred herein as "surface finishing". In a similar manner a pad for
use during surface finishing, such as a sanding pad, will generically be referred to
15 as a "surface finishing" pad.

BACKGROUND OF THE INVENTION

Known surface finishing machines are random orbital rotating machines which
typically utilise a disc. The disc or surface finishing pad may be a sanding disc, a
microfine finishing disc, or buffing disc depending upon the particular
20 application. For sanding and micro finishing large diameter discs have been tried
but have tended to be unusable because of clogging with dust. Accordingly, the
largest known discs are about 203 mm in diameter which seem to be relatively
unaffected by clogging. However, these discs mean that the area processed at any
time is relatively small and so the time taken to process a surface is relatively
25 long. Further, the use of these discs can lead to an uneven surface unless extreme
care and thus time are taken. Also, it is very difficult to use these discs without
scuffing the surface which leads to extra time being spent repairing the surface.

It is also known for surface finishing machines to have a dust collection system.
These have essentially a chassis about a mounted disc about which a partial
30 vacuum is created for conducting dust to a collection vessel.

It is also known that finishing pads may take shapes other than circular or disc
like.

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It is a proposed object of this invention to provide a surface finishing pad with multiple finishing areas, a surface finishing pad with an aperture therethrough for dust extraction, a mounting plate with multiple mounting areas for mounting surface finishing pads, and a surface finishing machine to obviate or minimise at least one of the aforementioned problems, or at least provide the public with a useful choice.

SUMMARY OF THE INVENTION

The invention may be said to reside, not necessarily in the broadest or only form, in a surface finishing pad adapted for mounting to a mounting plate, the surface finishing pad including a dust extraction aperture therethrough and said dust extraction aperture being adapted to align with a vacuum port of a mounting plate.

In a preferred form the surface finishing pad is a disc. In other forms the surface finishing pad may take other shapes such as rectangular.

The invention may also be said to reside, again not necessarily in the broadest or only form, in surface finishing pad including at least one dust extraction aperture therethrough, a plurality of finishing areas proud of an intervening web, the surface finishing pad being mountable to a mounting plate having at least one vacuum port with which the dust extraction aperture or dust extraction apertures are adapted to align, and the surface finishing pad being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the dust extraction aperture or dust extraction apertures by vacuum dust extraction means.

In one form the surface finishing pad is circular and adapted to be mountable to a mounting plate driven by a random orbital means.

In another form the dust extraction aperture or at least one of the dust extraction apertures is within the web. In yet another form the dust extraction aperture or at least one of the dust extraction apertures is within a one of the finishing areas.

In one form the finishing areas are radially spaced about the centre of the surface finishing pad.

The invention may also be said to reside, again not necessarily in the broadest or only form, in a mounting plate for a surface finishing machine including at least one vacuum port, a plurality of mounting areas proud of an intervening web and adapted to have mounted thereto surface finishing pads, and the mounting plate

being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the vacuum port or vacuum ports by vacuum dust extraction means.

According to one form, the mounting plate is disc like.

- 5 In another form the mounting areas are circular and adapted to receive mounted thereto surface finishing pads. These surface finishing pads or discs may take known forms.

- In one form the mounting plate has therethrough a vacuum port within the web portion for communication with dust extraction means adapted to extract dust
10 from the web portion. In another form the mounting plate has therethrough a vacuum port within one of the mounting areas for communication with dust extraction means adapted to have mounted thereto a surface finishing pad with an aperture therethrough adapted to align with the vacuum port and thereby being adapted to extract dust from the vicinity of the said mounting area. In yet a
15 further form, the mounting plate has channels within at least one of the mounting areas extending from the web portion and adapted to conduct dust from the vicinity of the said mounting area to the web portion for extraction therefrom.

In one form the mounting areas are radially spaced about the centre of the mounting plate.

- 20 The invention may also be said to reside in a surface finishing machine including either the before mentioned surface finishing pad or the before mentioned mounting plate and random orbital drive means adapted to drive the surface finishing pad or mounting plate.

- In one form the machine includes vacuum port means and connection means
25 adapted to facilitate vacuum dust extraction.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in the understanding of the invention preferred embodiments will now be described with reference to the accompanying drawings:

- Figure 1 is a perspective sketch of a surface finishing machine;
30 Figure 2 is a sketch of a handle for the top of the machine shown in figure 1;

- Figure 3 is a perspective sketch in cut away form of the machine with motor not drawn;
- Figure 4 is a cross sectional sketch of the machine with the motor not drawn;
- 5 Figure 5 is a perspective sketch in cut away form of the chassis;
- Figure 6 is a disassembled view of the transmission train from motor boss to base plate;
- Figure 7 is a cross sectional view of the fibre board disc;
- Figure 8 is a sketch of a perspective view of the fibre board disc;
- 10 Figure 9 is a perspective sketch of the mounting plate;
- Figure 10 is a plan view of the mounting plate;
- Figure 11 is a line sketch of a perspective view of a mounting area;
- Figure 12 is a perspective sketch of a second embodiment of the mounting plate viewed from beneath;
- 15 Figure 13 is a perspective sketch of a third embodiment of the mounting plate viewed from beneath;
- Figure 14 is a sketch of the disassembled view of a second embodiment of a surface finishing machine;
- Figure 15 is a plan view sketch of a fibre board disc;
- 20 Figure 16 is a perspective view sketch of the fibre board disc shown in figure 15;
- Figure 17 is a sketch of the central peg shown in figure 15;
- Figure 18 is a plan view sketch of a mounting plate;
- Figure 19 is a side view sketch of the mounting plate shown in figure 18;
- 25 Figure 20 is a perspective view sketch of the mounting plate shown in figure 18;

- Figure 21 is a plan view sketch of a base plate including counter weights;
- Figure 22 is a perspective view sketch of the base plate shown in figure 21;
- 5 Figure 23 is a perspective sketch of a further embodiment of a surface finishing pad viewed from beneath;
- Figure 24 is a sketch of a mounting plate and a surface finishing pad with two pairs of vacuum ports and dust extraction apertures;
- 10 Figure 25 is a sketch of under view of a surface finishing machine having a generally rectilinear configuration;
- Figure 26 is a perspective sketch of a further embodiment of a surface finishing pad viewed from beneath; and,
- 15 Figure 27 is a perspective view sketch of a further embodiment of a mounting plate adapted to mount three surface finishing pads.

DETAILED DESCRIPTION OF THE INVENTION

- It will be appreciated that the accompanying drawings are sketches and not engineering design drawings. The intention is to assist understanding of the invention and so perspective or features may be distorted or omitted for clarity.
- 20 Throughout the drawings the same reference numeral will be used to refer to the same or similar feature.

The surface finishing machine depicted in the figures is of configuration for finishing a bench top.

- 25 The machine (1) has a chassis (2) upon which is mounted a 550 W electric motor (3) which operates at 1450 rpm. Extending from the chassis is a side handle (4) with a vacuum connection (5) at one end for connection with a vacuum dust extraction system.

- 30 The side handle is tubular and provides a conduit from within and beneath the chassis to the vacuum system. The side handle is mounted by a mating flange (6) and bolts to the chassis. Whilst only one connection to the extraction system is

shown for this embodiment a number may be provided if desired. For example a plurality of radially spaced apertures within the chassis may be provided and connected by hosing to a single hose which leads to the external vacuum extraction system.

- 5 Further, for some applications such as buffing the external vacuum extraction system may, as a matter of preference be disconnected.

Also extending from the chassis are two legs (7 and 8) by which the machine may be rested in an upright configuration upon a flat surface thereby allowing access to the mounting plate for surface finishing pad changing.

- 10 The machine has an overall width of about 400 mm and can finish about a 360 mm wide portion of a surface at one time. The large width means that a surface can be finished more quickly than when using prior known machines. Further, the width reduces the tendency of unevenness in the finished surface so reducing the time needed to ensure levelness. The weight of the machine is about 25 Kg
15 which means that the weight of the machine is sufficient to press the surface finishing pads against the surface for correct operation. There is no need for an operator to press the machine against the surface and therefore the risk of scuffing is significantly reduced.

- 20 The chassis is made of aluminium and is shaped to fit about and skirt the mounting plate and attached mechanism leaving the discs extending beyond the chassis. In this way the chassis forms a shroud that facilitates dust collection and extraction. Subtending from the lower rim of the chassis is a rubber skirt (9) which makes a partial seal with a surface during operation.

- A variation to the just mentioned machine includes a top handle (10) which has a
25 push button (11) on/off switch with which to control the operational state of the electric motor. It will be appreciated that the wiring is not shown but would take known forms apparent to a skilled addressee. The handle includes a moulded hand grip (12) made of resilient material to reduce vibration transmitted to an operator. The top handle is mounted to the top of the motor by arcuate flanges
30 (13 and 14) which mount to the cylindrical side of the motor.

Within the chassis is a mounting plate (15) which is mounted to a foam rubber disc (16) which in turn is mounted to a fibre board disc (17). The rubber disc is about 7 mm thick and provides a resilient backing for the mounting plate whilst the fibre board disc is about 9 mm thick and provides a rigid support therefor.

The fibre board disc is mounted to a base plate (18) of steel the diameter of which is less than that of the fibre board disc to reduce overall machine weight. The fibre board disc acts to extend the diameter of the base plate without adding significant weight to the machine.

- 5 The base plate is mounted by bearing centre (19), bearing (20), bearing retainer (21), spacer (22) to main plate (23). The base plate, bearing centre, bearing, bearing retainer and spacer are offset from the centre of the main plate by 10 mm to one side. To the lower surface of the main plate is mounted a crescent shaped counter weight (24), of mass and dimensions to counter balance the offset
- 10 suspended assembly of base plate and mounting plate and associated parts. The main plate is mounted to the rotor of the motor by boss (25).

Upon the upper surface of the fibre board disc proximal to its perimeter is an annular ring (26) of urethane which substantially acts as a seal with the chassis. The partial vacuum for dust extraction is created within the ring.

- 15 From the above it will be appreciated that the electric motor drives the main plate at 1450 rpm under normal conditions. The offset mounting of the base plate means that it and its suspended parts orbit the main plate by an eccentric motion of 20 mm from circular. This motion together with the bearing means that the base plate and the suspended parts rotate in a random orbital manner depending
- 20 upon the surface and experienced load. This arrangement effects an orbital drive means for the mounting plate.

- The mounting plate, fibre board disc and rubber disc have aligned apertures therethrough which form vacuum ports (two shown as 27 and 28). These are within the ring of the chassis and communicate with the vacuum extraction
- 25 system.

- The mounting plate is made of urethane, approximately 6 mm thick and is resiliently flexible. It has four radially spaced finishing pad mounting areas (one shown as 29) spaced about its centre each 180 mm in diameter. The pad mounting areas are circular in shape and adapted to have mounted thereto by use
- 30 of hook and loop means fastener, as commonly known under the trade mark VELCRO, surface finishing pads. The pad mounting areas are proud of the mounting plate by 3 mm interspaced by web portions (30) which are approximately 3 mm thick. Within the mounting areas are channels (one shown as 31) 1 mm deep between the vacuum port and the web portion for conducting

dust either to the vacuum port through the mounting areas or to the intervening web portion and thence to a vacuum port therein. The vacuum port within the mounting areas are in this embodiment proximal to the perimeter of the mounting plate where centrifugal force will tend to move dust. The channels are
5 approximately 10 mm wide and are arcuate in profile. Other profiles and widths may be used as desired whilst meeting the object of clearing the dust.

A second embodiment of the mounting plate is illustrated in figure 12. This mounting plate is of similar construction as that shown in figure 9, except that no channels are provided. The vacuum port within the mounting area is positioned
10 further away from the periphery of the mounting area, than that shown for the first embodiment. This is preferred to alleviate the problem of the sanding discs lifting at about that area as a result of the lack of sufficient surface adhesion. This embodiment of the mounting plate is useful where sanding discs are to be attached to the mounting plate by the use of an adhesive rather than VELCRO
15 (trade mark). Sanding discs used in the first embodiment tend to conform to the shape of the mounting area under the influence of the vacuum, however certain sanding pads currently on the market are particularly rigid and will not do so. The second embodiment of the mounting plate can then be used.

A third embodiment of the mounting plate is illustrated in figure 13. This
20 mounting plate is very similar in construction to the mounting plate shown in figure 9. The primary differences are that there are less channels, and that the vacuum port within the pad mounting area is positioned further away from the periphery of the pad mounting area. These modifications are preferred where there are difficulties in providing sufficient adhesion for the pad to stay on the
25 mounting plate during use.

The mounting plate is secured to the fibre board disc by means of radially spaced bolts. This mounting is not shown in all figures but takes a form apparent to a skilled addressee. Discussion concerning another embodiment of a surface
finishing machine below mentions and depicts the bolts. In this first embodiment
30 the foam rubber disc has appropriate apertures and is secured in place by the bolts securing the mounting plate to the fibre board disc.

To the mounting areas may be mounted modified standard 180 mm (6 inch) discs that are commonly available within Australia and in at least some overseas countries. These discs, it is intended, will be available with an aperture
35 therethrough to align with the vacuum port within the mounting area.

Alternatively, it is a relatively simple matter to cut a suitable aperture through a prior known disc. Such apertures are not required with polishing or buffing discs where dust is not created to any serious extent.

The second embodiment of the surface finishing machine will now be discussed.

- 5 The machine is similar to the first and also includes an electric motor, suitable controls, handles and vacuum extraction system. The differences lie within the chassis and these will be discussed.

To the rotor of the motor is mounted a boss (32). There is a spacer (33), bearing retainer (34), bearing (35), bearing centre (36) and main plate (37) which
10 collectively mount the main plate to the boss using bolts (one shown as 38). This is generally as previously described.

The main plate, again made of steel, takes a different shape being best seen in figure 21 and is not a circular disc. The weight of the main plate is accordingly reduced. To the main plate is mounted by bolts two counter weights (39 and 40)
15 each being fasten to opposite sides of the main plate. A further countering weight is provided by counter balance (41) which is also bolted to the main plate. It will be appreciated that the function of the main plate is as before and is part of an orbital drive means.

Mounted by bolts to the main plate is a base plate (42) which again is made of
20 steel. The base plate is essentially as previously described and is mounted off centre with respect to the main plate to effect the random orbital motion.

Mounted by bolts to the base plate is a fibre board disc (43) which in plan view is not circular. Its shape is best seen in figure 15. It is 9 mm thick and quite rigid so providing a firm backing to a mounting plate later to be described. Glued to the
25 fibre board disc are four mounting area pegs (one shown as 44) and a central peg (45) all made of P.V.C. cylindrical tubing approximately 33 mm in diameter. These pegs provided registering means for the mounting plate and conduits for the vacuum ports through which dust may be extracted.

The central peg has an external circumferential groove (46) of approximately 0.5
30 mm depth and 2 mm width. This groove is located so that it is approximately level with but slightly spaced from the surface (47) from which the pegs project. This groove forms part of a fastening means for securing the mounting plate to the fibre board disc.

The mounting plate (48) is of layer construction having a first layer (49) of urethane approximately 6 mm thick, a second layer (50) of foam rubber of approximately 9 mm thickness, and a final layer being a P.V.C. backing plate (51) of approximately 1 mm thickness. These layers are glued together to make a laminated structure.

The foam rubber layer is equivalent to the foam rubber disc of the first embodiment. Likewise with the first layer and the mounting plate of the first embodiment. It will be appreciated that the laminated construction simplifies assembly and disassembly but functionally is the same as the separate components of the first embodiment.

All the layers of the mounting plate include holes to receive the pegs projecting from the fibre board disc. The hole of the backing plate to receive the central peg is slightly smaller than the diameter of the peg, approximately 32 mm compared with approximately 33 mm, so forming a circular detent (52). The backing plate is sufficiently resilient to flex under manual pressure of fitting the mounting plate to allow the central peg to be received and when against the fibre board disc the backing plate clicks into the groove. This prevents unintentional separation of the fibre board disc and the mounting plate whilst allowing easy fitting. The four mounting area pegs register the mounting plate relative to the fibre board disc. The backing plate is also flexible enough to allow for intentional removal of the mounting plate by an operator.

Being able to change the mounting plate allows a number of mounting plates to be prepared and interchanged as required before requiring new surface finishing pads to be fitted. Also, changing mounting plates permits changing from one grade of finishing pad to another including going from sanding to buffing.

Through the mounting plate are vacuum ports (53, 54, 55, 56 and 57) defined by the pegs. There are also four mounting areas (one shown as 58) to which a surface finishing pad (one shown as 59) can be mounted.

Depending upon the application and whether dust is created, the surface finishing pad has a dust extraction aperture (60). The dust extraction aperture aligns with the vacuum port within the respective mounting area. The surface finishing pad may be a modified previously known and commercially available surface finishing pad, the modification being the cutting of the dust extraction aperture.

It will be appreciated that each mounting area (one shown as 61) of a mounting plate (62) and respective surface finishing pad (63) may have multiple aligned vacuum port (two shown as 64 and 65) and dust extraction apertures (two shown as 66 and 67) as illustrated in figure 24.

- 5 Whilst circular surface finishing pads have been described it will be appreciated that the arrangement may be altered to accept rectangular surface finishing pads (68). In this form the surface finishing machine has a chassis (69), fibre board disc and mounting plate (70) with a generally rectilinear configuration. This is illustrated in figure 25. The mounting areas (one shown as 71) has a vacuum port (one shown as 72) and the surface finishing pad may have a respective dust extraction aperture (73).
10 Within the mounting plate are other vacuum ports through the web (74) interconnecting the mounting areas including rectangular ports (one shown as 75) between mounting areas.

- 15 It will be appreciated that due to currently available discs it is preferred to mount separate discs to the pad mounting areas. However, it is envisaged that discs may be made to cover the whole mounting plate whilst providing for operation as hereinbefore explained. Figure 23 illustrates a surface finishing pad (76) made of a suitable material such as urethane which would be mounted to a flat faced mounting plate through which suitable vacuum ports exist to align with the dust extraction apertures (two
20 shown as 77 and 78). The surface finishing pad has four raised surface finishing areas (one shown as 79) upon which is the finishing material. The surface finishing pad may include channels (one shown as 80) which effect the same function as the previously described channels as illustrated in figure 26.

- 25 The mounting plate (81) illustrates the use of three mounting areas (one shown as 82) with vacuum ports (two shown as 83 and 84). Apart from the number of the mounting areas and appropriate changes to the number and location of vacuum ports this configuration is essentially the same as previously described.

- 30 It will also be appreciated that with an appropriate handle, longer than that previously illustrated, the machine just described can be converted to be used for floor operation with the operator being able to stand during use.

Other variations to the just described embodiment will be apparent to the skilled addressee including the provision of mounting areas spaced about two or more

rings about the centre of the mounting plate thereby allowing a greater area to be finished at any time.

It will be appreciated that this disclosure is not intended to limit the invention to the preferred embodiment or details thereof. It is intended to give an overview of the invention as conceived and other embodiments will be apparent to the skilled addressee all of which fall within the spirit of the invention.

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CLAIMS

1. A mounting plate as hereinbefore described for a surface finishing machine, the mounting plate including at least one vacuum port, a plurality of mounting areas proud of an intervening web and adapted to have mounted thereto surface finishing pads, and the mounting plate being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the vacuum port or vacuum ports by vacuum dust extraction means.
2. A mounting plate as in claim 1 wherein the vacuum port or at least one of the vacuum ports is within the web.
3. A mounting plate as in claim 1 wherein the vacuum port or at least one of the vacuum ports is within a one of the mounting areas.
4. A mounting plate as in claim 1 wherein the mounting areas are integral with the web.
5. A mounting plate as in claim 1 wherein the mounting areas are formed separately to the web and are fitted thereto so that the mounting areas are proud of the web.
6. A mounting plate as in any one of claims 1 to 5 inclusive being adapted to be driven by a random orbital means.
7. A mounting plate as in any one of claims 1 to 6 inclusive wherein the centre of the mounting plate is part of the web.
8. A mounting plate as in claim 7 wherein the mounting areas are radially spaced about the centre of the mounting plate.
9. A mounting plate as in claim 8 including at least three mounting areas.
10. A mounting plate as in claim 9 including four mounting areas.
11. A mounting plate as in any one of claims 7 to 10 inclusive including a plurality of vacuum ports, at least one vacuum port being through the web and proximal to the centre of the mounting plate, and other vacuum ports being through the web and proximal to the periphery of the mounting plate.
12. A mounting plate as in any one of claims 7 to 11 inclusive including a plurality of vacuum ports, at least one vacuum port being through each mounting

area being adapted to align with a dust extraction aperture of a surface finishing pad.

13. A mounting plate as in claim 12 wherein the mounting areas are circular and the vacuum port of each mounting area being between the centre of the
5 respective mounting area and the periphery of the respective mounting area distal the centre of the mounting plate.

14. A mounting plate as in any one of claims 1 to 13 inclusive wherein each mounting area has at least one channel therein adapted to direct dust to the vacuum port or a one of the vacuum ports through the respective mounting area.

10 15. A mounting plate as in any one of claims 1 to 14 inclusive wherein the mounting areas are circular and of diameter less than or equal to 373 mm.

16. A mounting plate as in any one of claims 1 to 15 inclusive including hook and loop means adapted for attaching a surface finishing pad to each mounting area on the mounting plate.

15 17. A mounting plate as in any one of claims 1 to 16 inclusive comprising a plurality of layers between an external surface upon which the mounting areas lie and a rear surface, and the mounting plate including a first layer including the mounting areas made of urethane and a second layer of resilient material.

18. A mounting plate as in any one of claims 1 to 17 inclusive wherein the
20 vacuum port or at least one of the vacuum ports fits over a hollow cylindrical dust extraction peg, the dust extraction peg having an external circumferential groove, and the mounting plate including a thin backing plate with a peg aperture of diameter slightly smaller than the external diameter of the peg and adapted to receive the dust extraction peg, and the thickness and resiliency of the backing
25 plate being such that the mounting plate may be pushed onto and pulled off the dust extraction peg and when secured relative to the dust extraction peg the backing plate resides within the groove.

19. A surface finishing pad including the mounting plate of claim 1 and a surface finishing disc mounted to each mounting area, the surface finishing disc
30 suitable for sanding, burnishing or polishing a surface.

20. A surface finishing machine including
a mounting plate as hereinbefore described and having at least one vacuum port, a plurality of mounting areas proud of an intervening web and adapted to

15

have mounted thereto surface finishing pads, and the mounting plate being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the vacuum port or vacuum ports by vacuum dust extraction means,

5 and random orbital drive means adapted to drive the mounting plate.

21. A surface finishing machine as in claim 20 wherein the mounting areas are formed separately to the web and are fitted thereto so that the mounting areas are proud of the web.

10 22. A surface finishing machine as in either claim 20 or 21 including vacuum dust extraction means adapted to facilitate vacuum dust extraction through respective vacuum ports on the mounting plate.

15 23. A surface finishing machine as is claim 22 wherein the dust extraction means includes at least one vacuum aperture adapted to align with at least one vacuum port of the mounting plate, and vacuum connection means connecting the aperture to a vacuum source.

24. A surface finishing machine as is claim 23 including dust collection means for the collection of the extracted dust.

20 25. A surface finishing machine as in claim 23 wherein the vacuum connection means includes at least one hollow cylindrical dust extraction peg, the dust extraction peg adapted to align with at least one vacuum port of the mounting plate, the mounting plate including a thin backing plate with a peg aperture of diameter slightly smaller than the external diameter of the peg and adapted to receive the dust extraction peg, and the thickness and resiliency of the backing plate being such that the mounting plate may be pushed onto and pulled off the
25 dust extraction peg and when secured relative to the dust extraction peg the backing plate resides within an external circumferential groove on the peg.

26. A surface finishing machine as in either claim 20 or 25 including a base plate connected to the random orbital drive means and adapted to receive the mounting plate.

30 27. A surface finishing machine as in claim 25 wherein the at least one peg is attached to an intermediate disc onto which the mounting plate is fitted.

28. A surface finishing machine as in claim 27 wherein the random orbital means includes at least one eccentrically driven weight, and the base plate is

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connected off centre with respect to said weight to thereby result in a random orbital motion of the base plate.

29. A surface finishing machine as in claim 28 including a chassis which shrouds the base and mounting plates and has a downwardly open aperture for
5 exposing the mounting plate and surface finishing pad connected thereto to a surface to be finished.

30. A surface finishing machine as in claim 29 wherein the chassis also includes a flexible skirt extending from a lower edge of the chassis, the flexible skirt adapted to form a partial vacuum seal with a surface during operation.

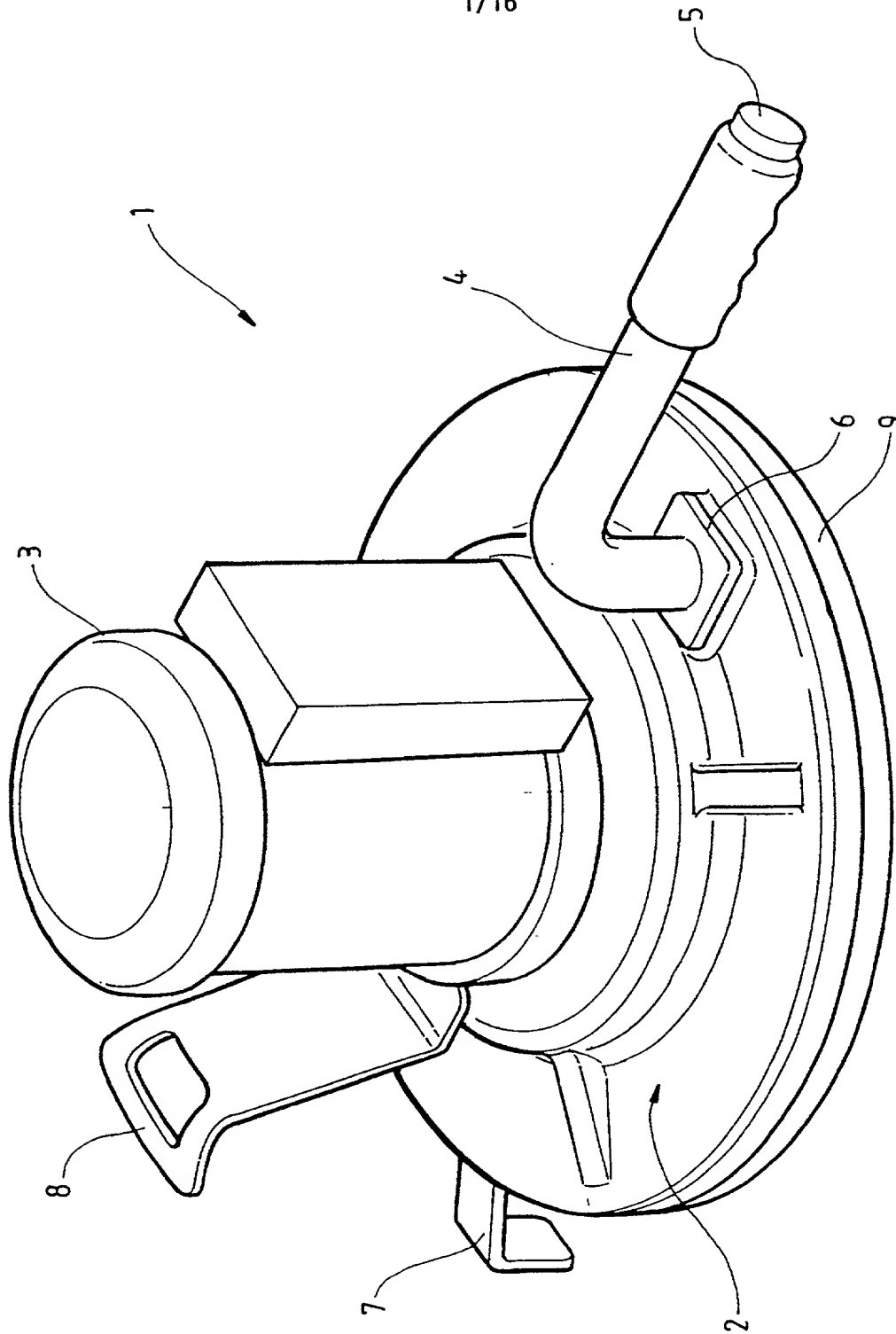
- 10 31. A surface finishing machine as in claim 30 wherein at least one of the vacuum ports is a gap between the periphery of the mounting plate and the chassis.

ABSTRACT

Disclosed is a surface finishing pad (59) having a dust extraction aperture (60). The pad may have multiple finishing areas (63) or a number of pads may be mounted to a mounting plate (48, 62) that is driven by orbital drive means. The dust extraction apertures align (60) with vacuum ports through which dust may be carried away from a surface undergoing finishing. The mounting plate (48) may have a plurality of channels (46) to direct dust to vacuum ports for extraction. The pad and the machine disclosed, which uses the pads, allows large areas to be finished without dust clogging the pads.

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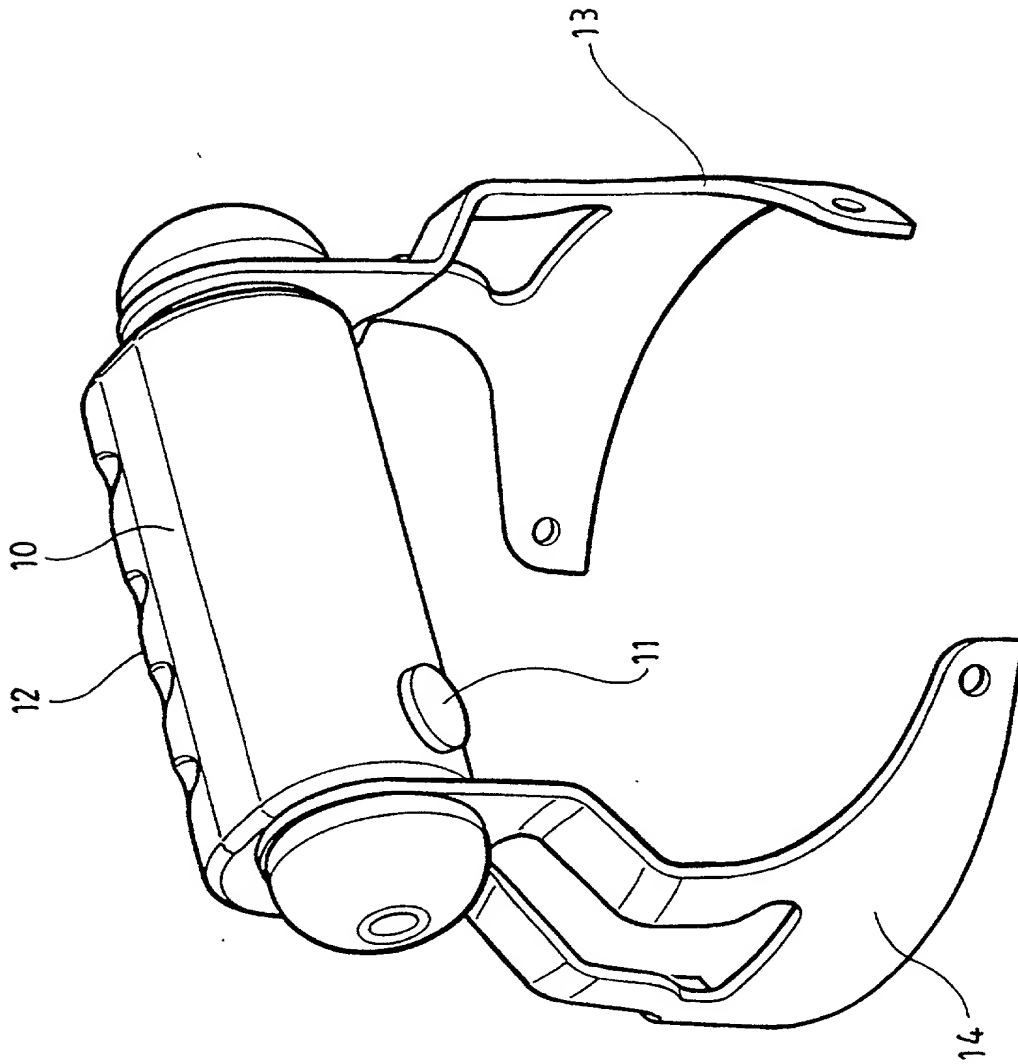


FIG 2

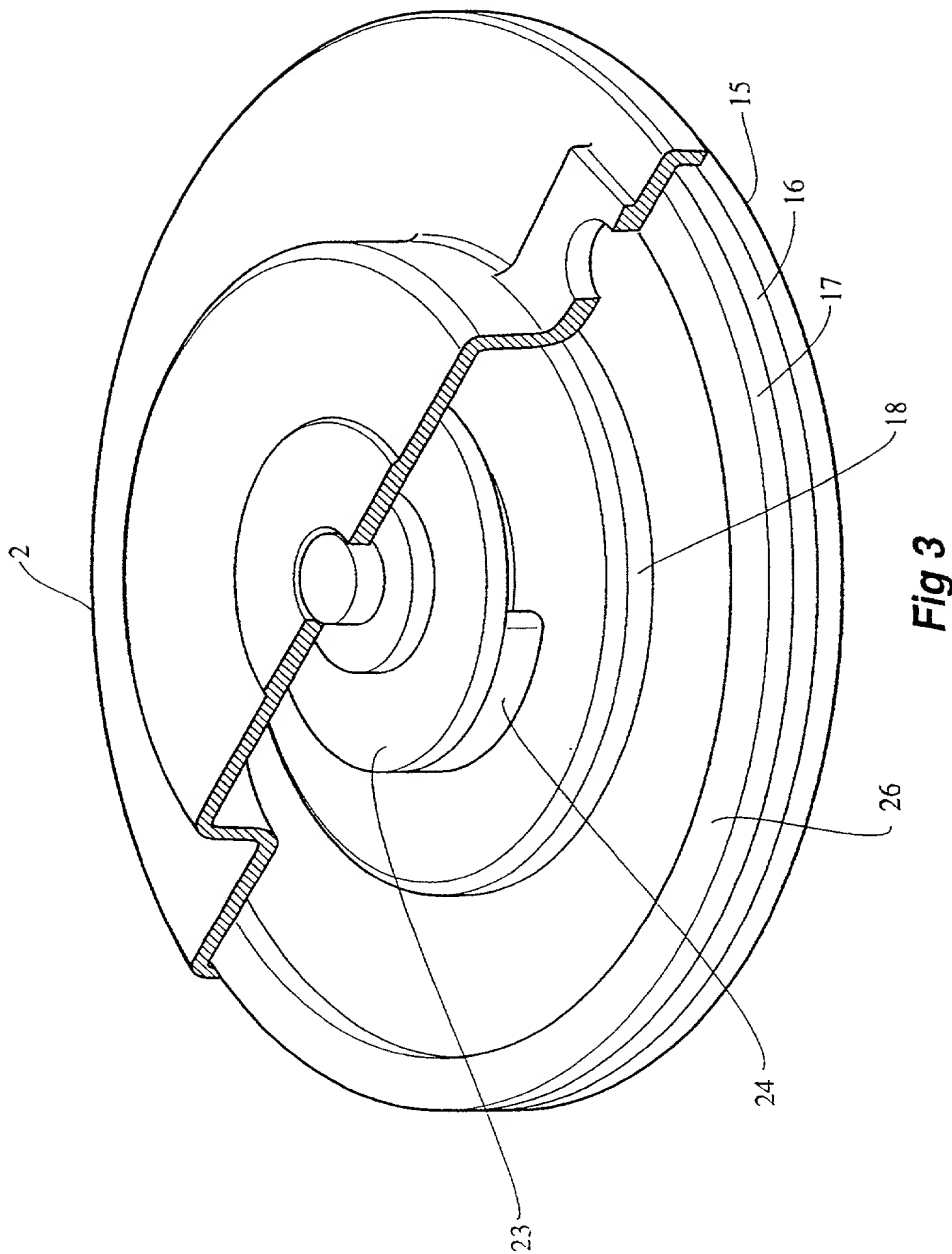
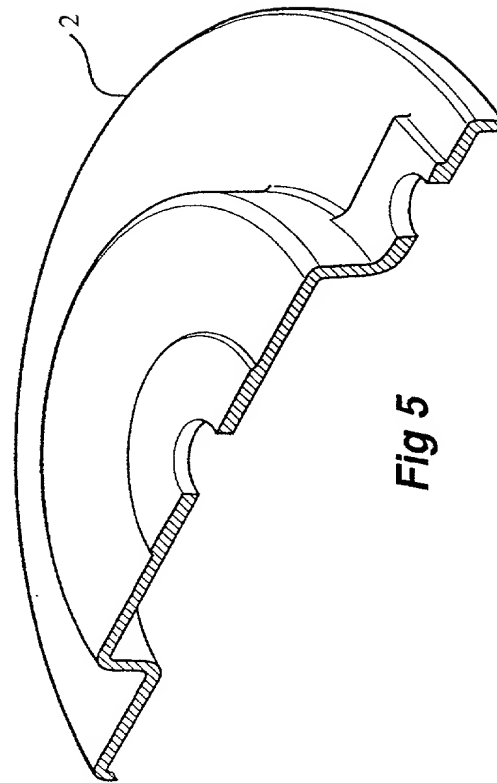
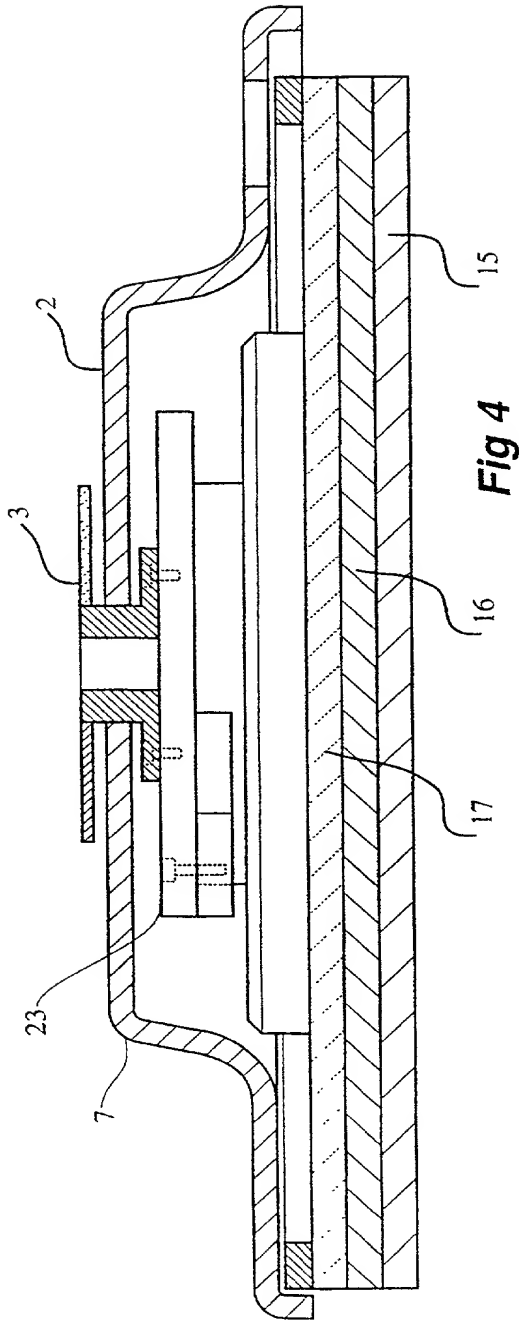
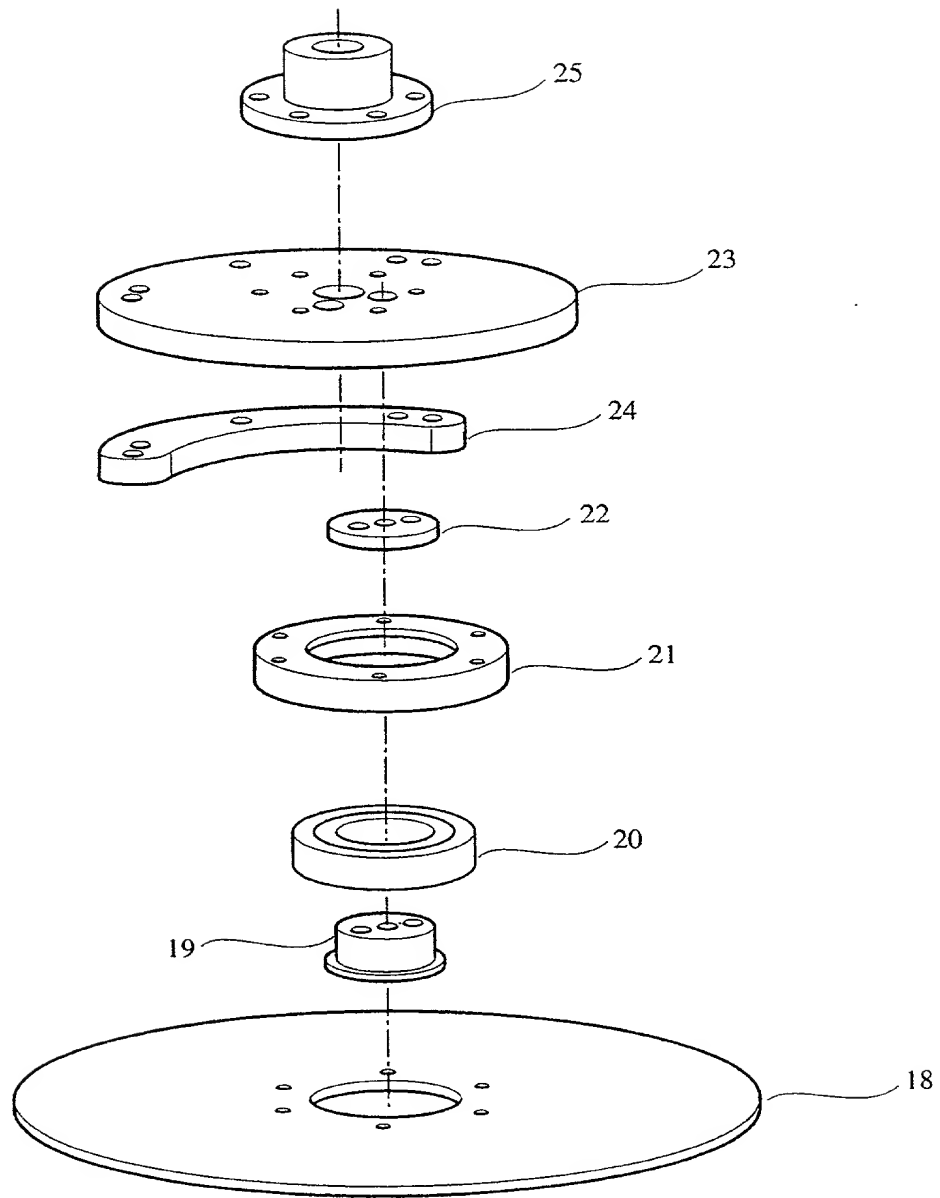
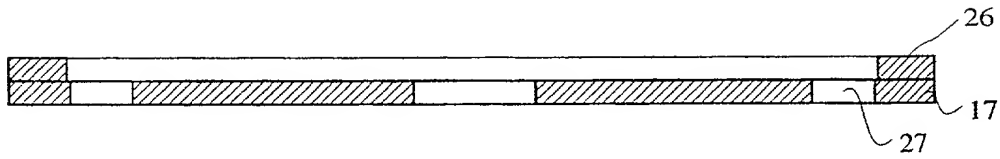
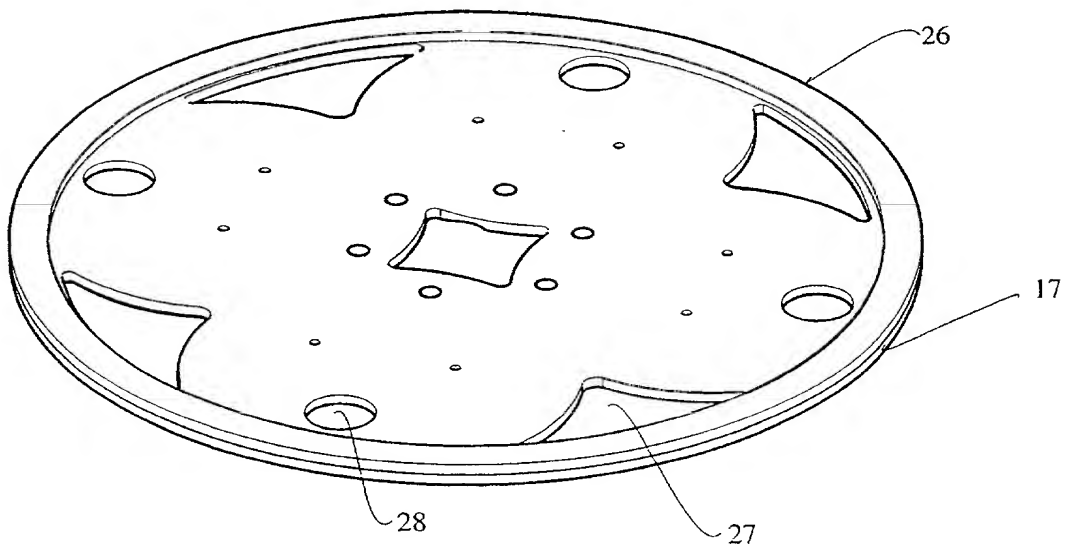


Fig 3



**FIG 6**

**Fig 7****Fig 8**

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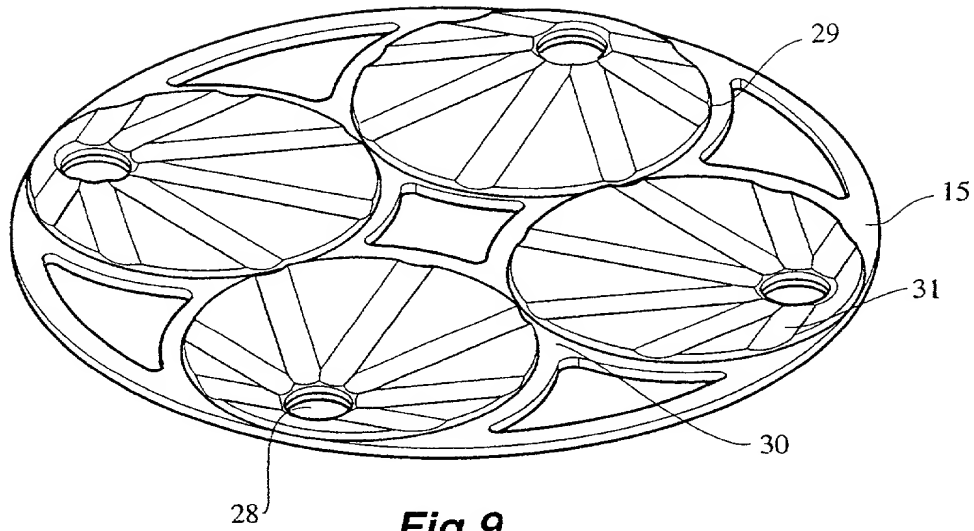


Fig 9

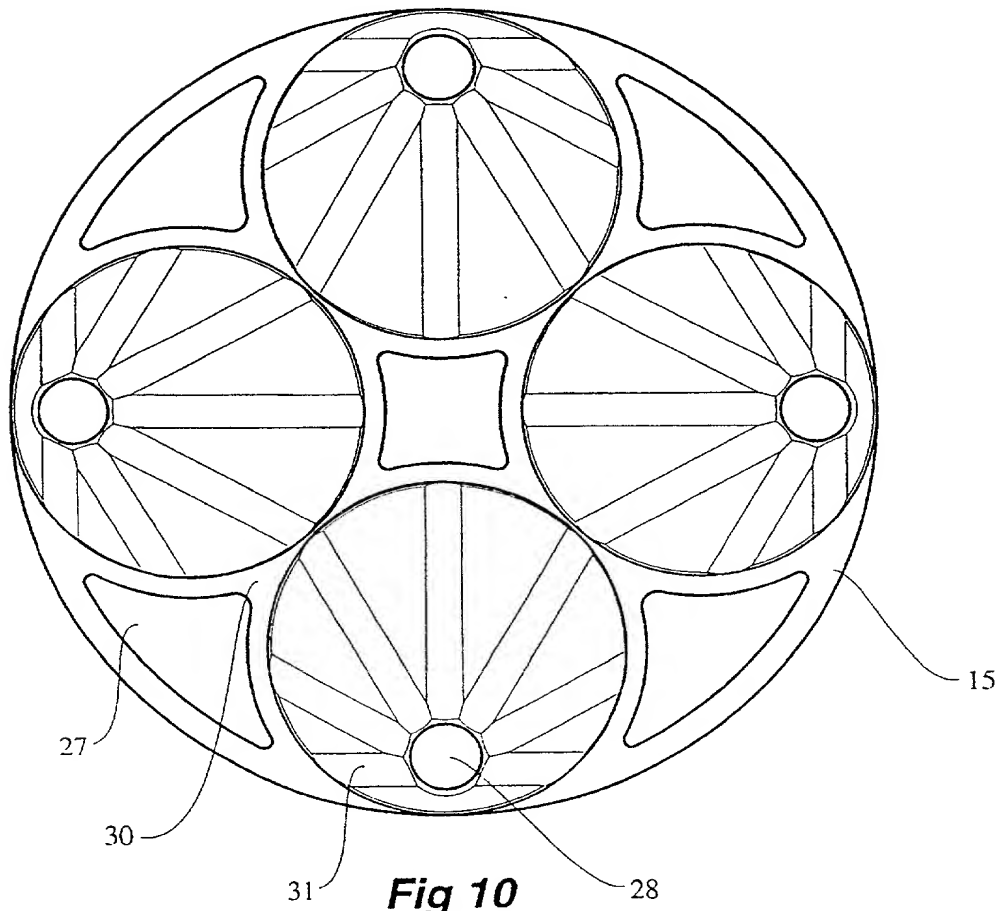
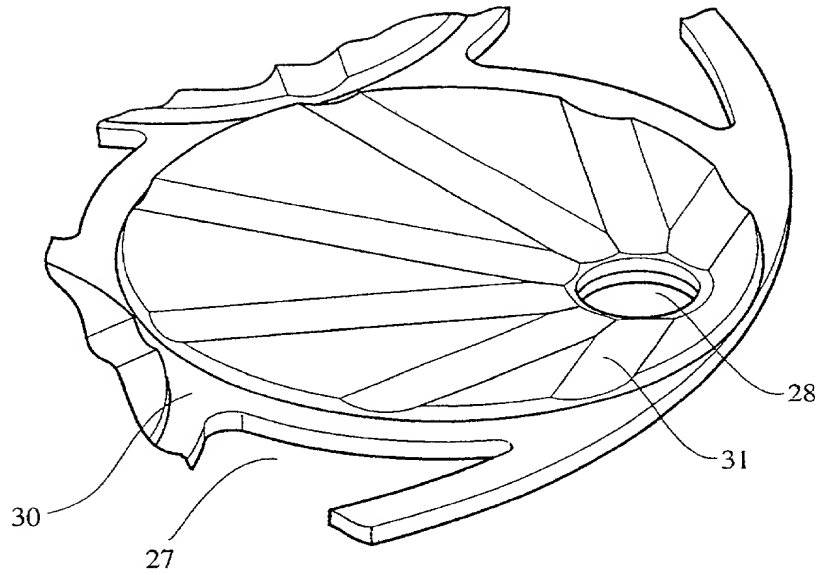
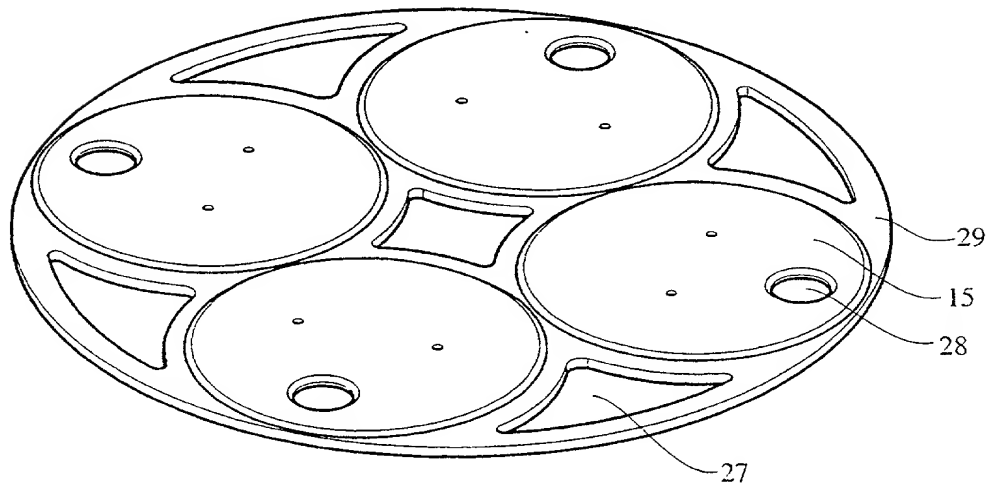
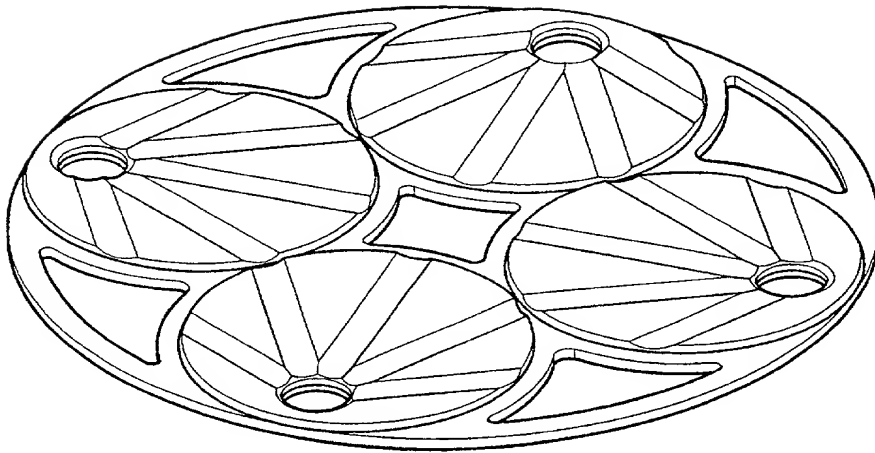
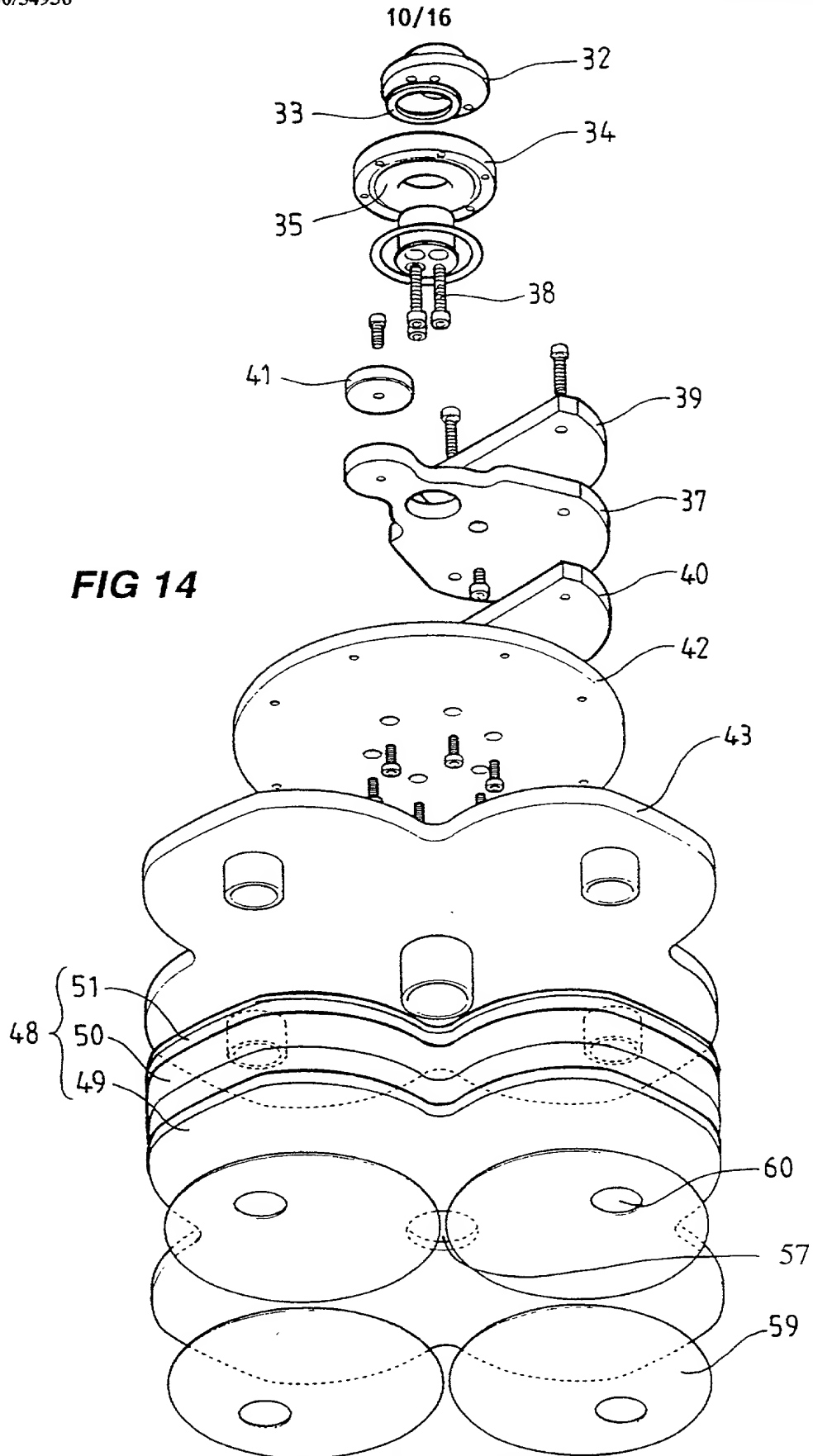


Fig 10

**Fig 11****Fig 12**

**Fig 13**



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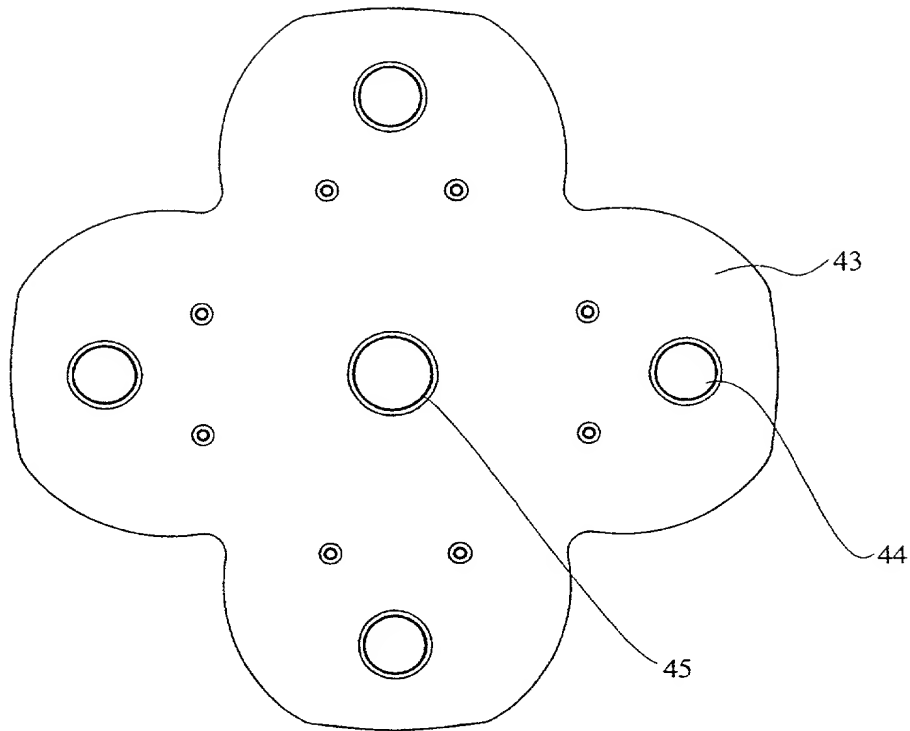


FIG 15

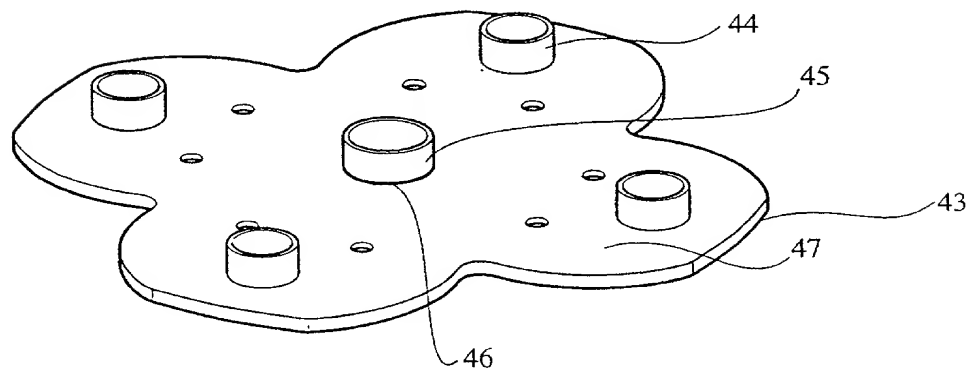


FIG 16

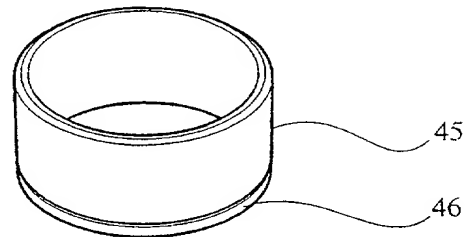
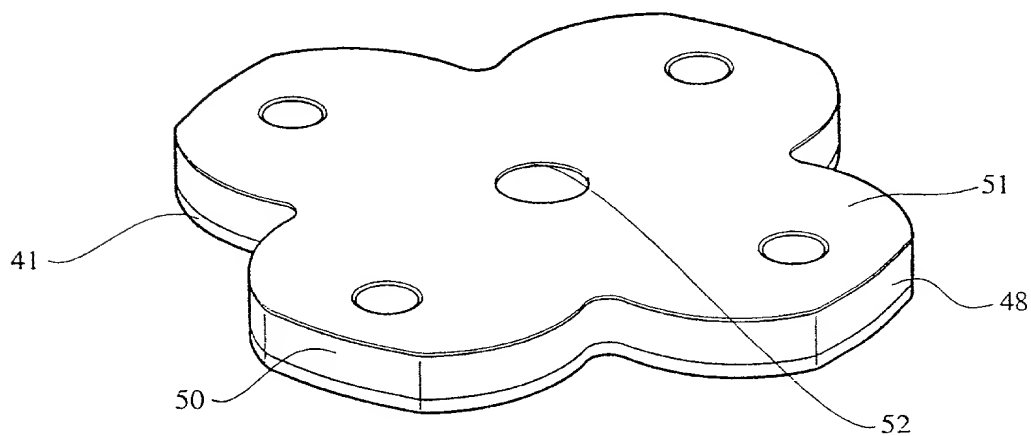
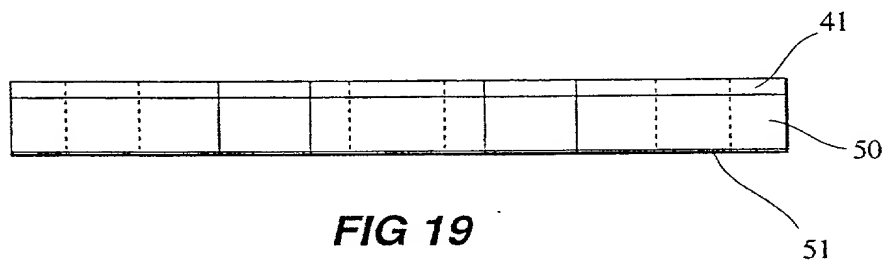
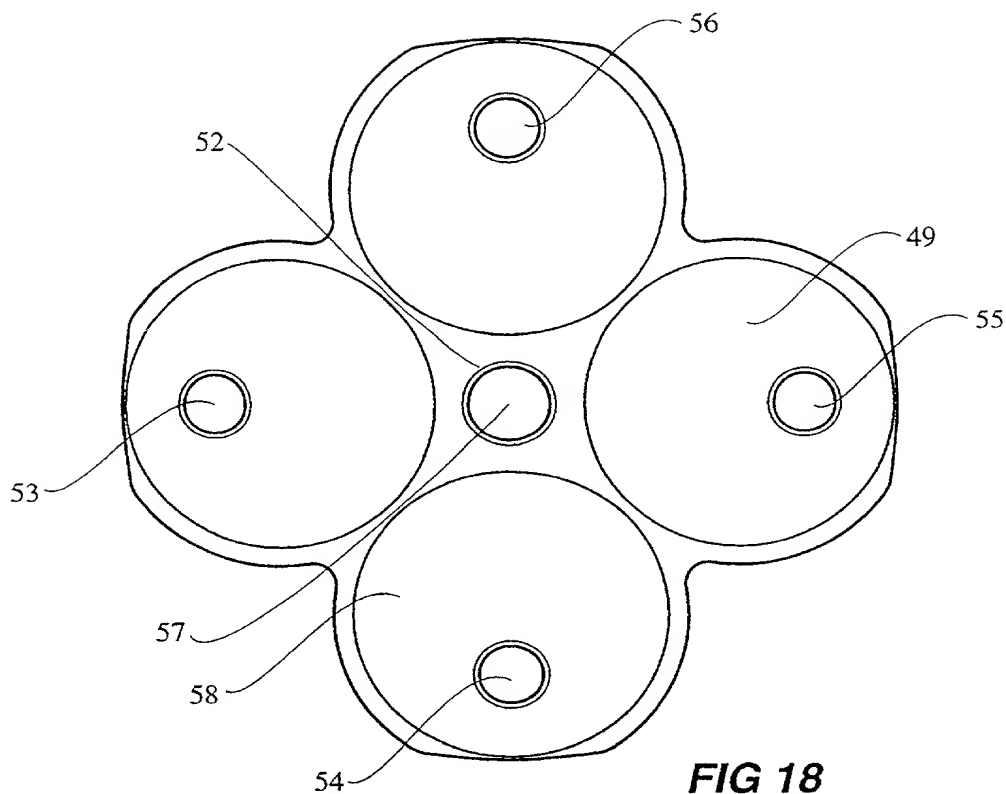
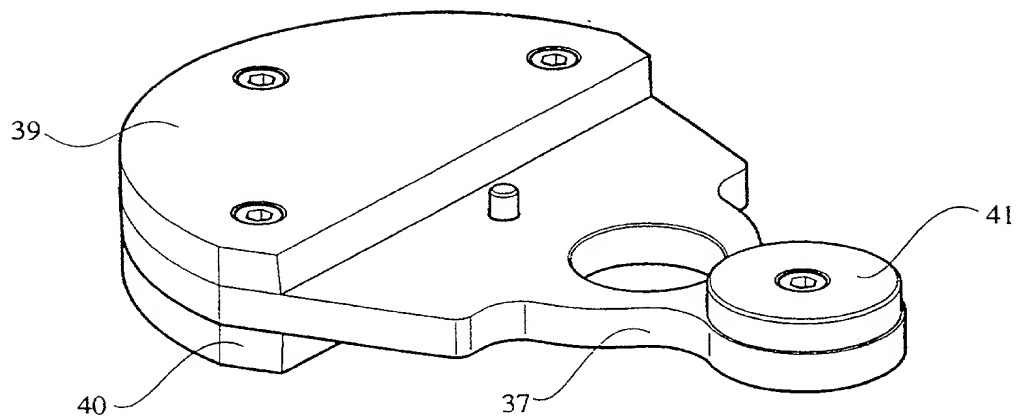
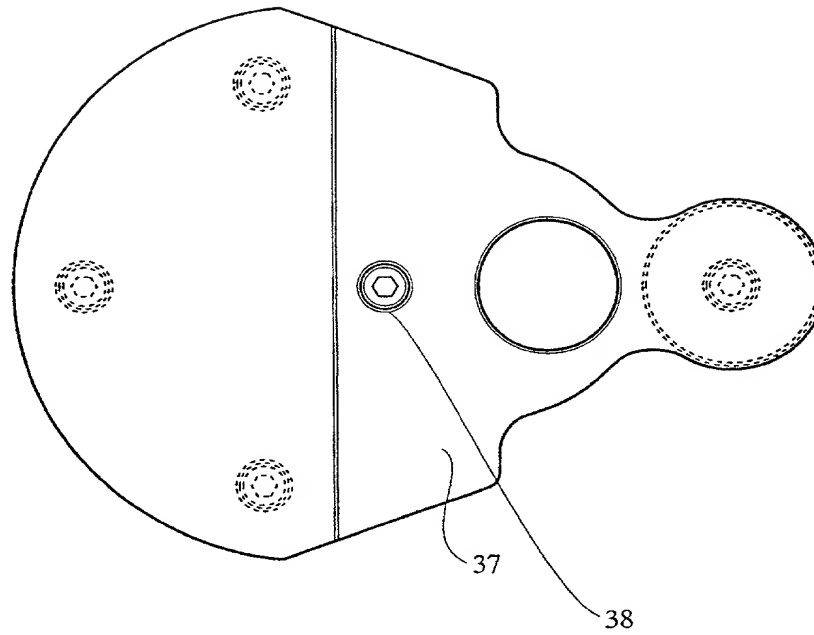


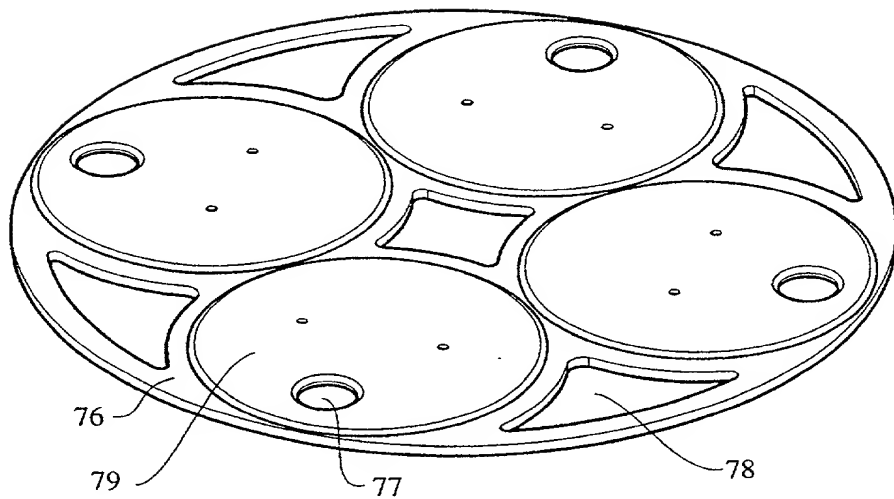
FIG 17

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**Fig 23**

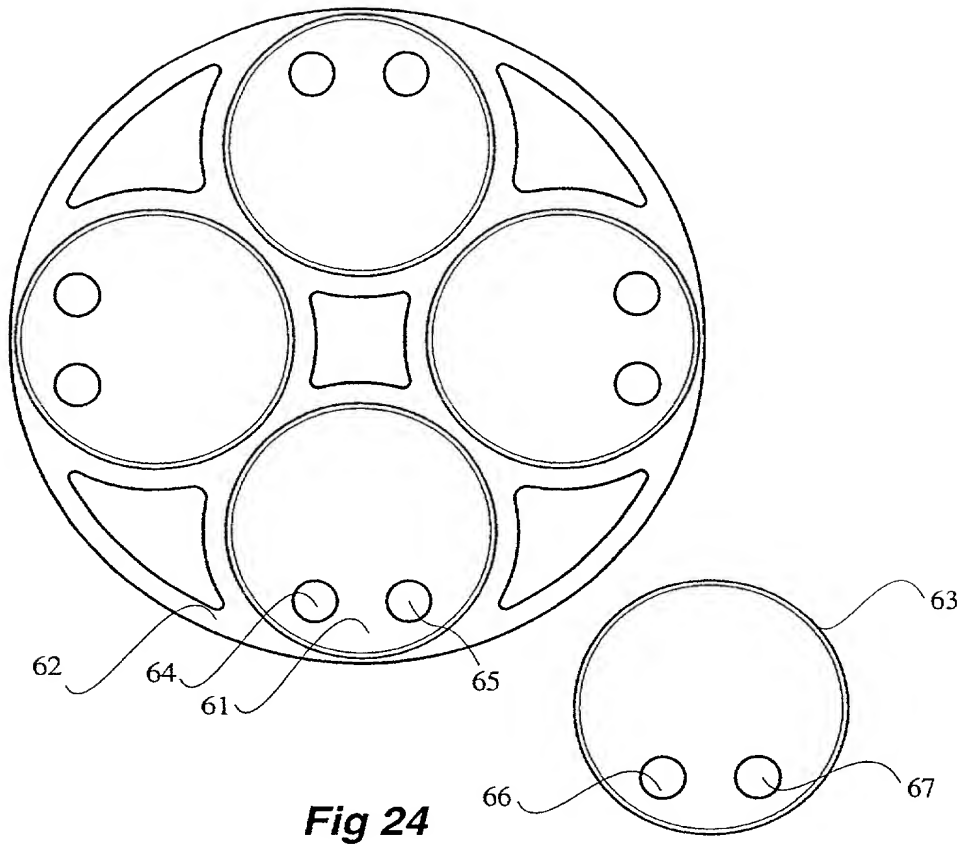


Fig 24

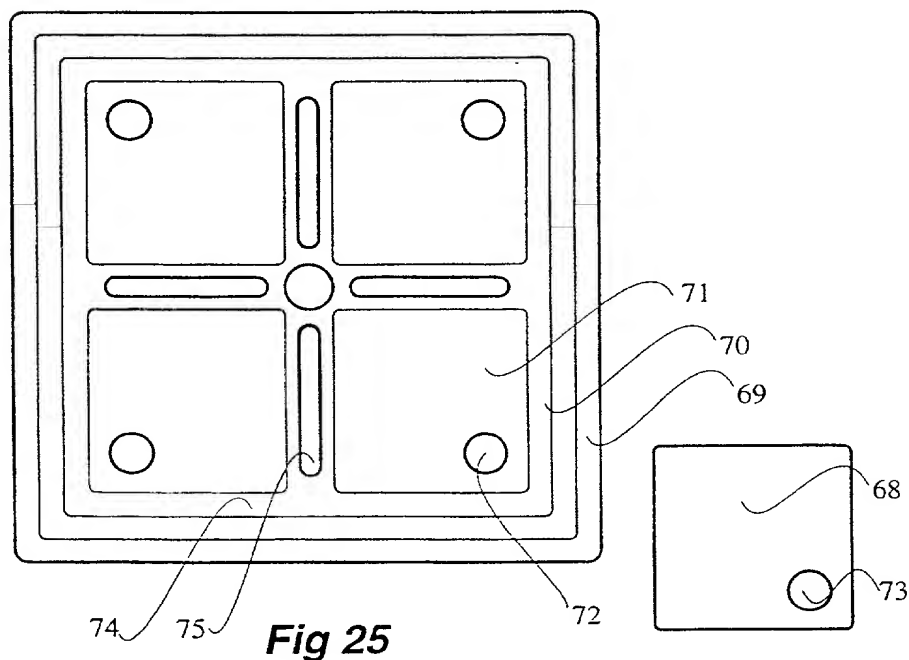


Fig 25

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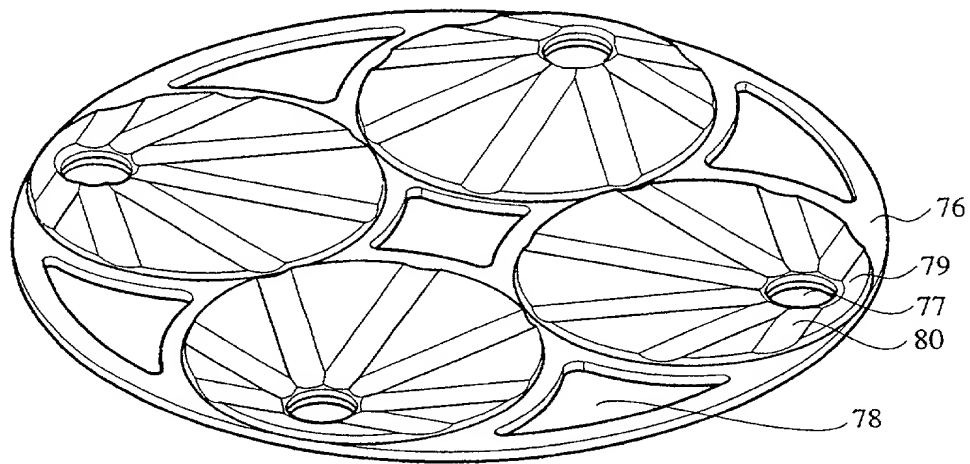


Fig 26

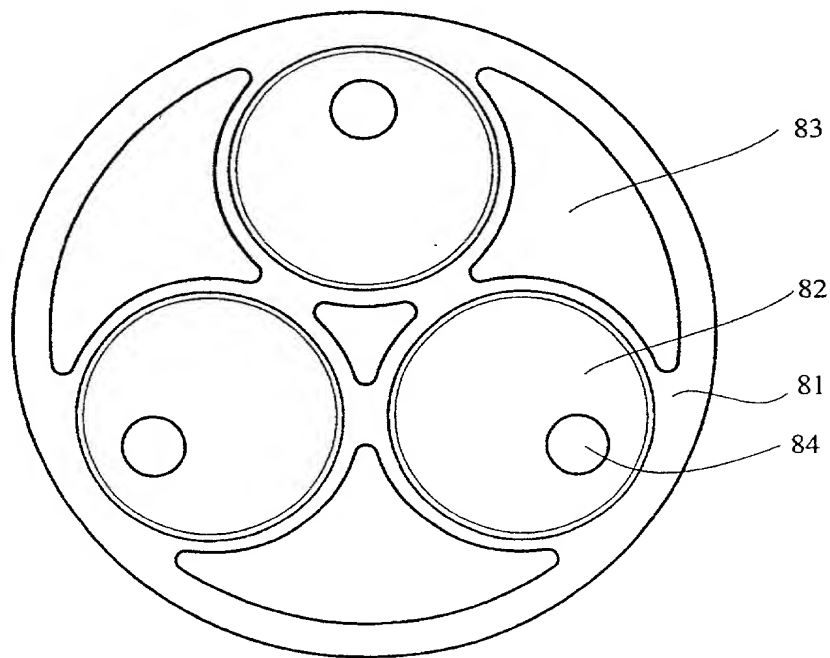


Fig 27

SURFACE FINISHING MACHINE

FIELD OF THE INVENTION

5 The invention disclosed herein relates to a surface finishing machine. It also relates to surface finishing pads for use with the surface finishing machine. The surface finishing machine may be used for sanding, burnishing, polishing and the like of surfaces such as timber, stone, acrylic and the like. The surface may be, amongst others, bench tops and floors. Without intending to limit the invention the application of finishing a solid surface, that is, an acrylic bench top will be
10 used as explanative of the invention. It will be appreciated that the invention is applicable to other applications and other surfaces.

The processes of sanding, burnishing, polishing and the like of surfaces is collectively referred herein as "surface finishing". In a similar manner a pad for use during surface finishing, such as a sanding pad, will generically be referred to
15 as a "surface finishing" pad.

BACKGROUND OF THE INVENTION

Known surface finishing machines are random orbital rotating machines which typically utilise a disc. The disc or surface finishing pad may be a sanding disc, a microfine finishing disc, or buffing disc depending upon the particular
20 application. For sanding and micro finishing large diameter discs have been tried but have tended to be unusable because of clogging with dust. Accordingly, the largest known discs are about 203 mm in diameter which seem to be relatively unaffected by clogging. However, these discs mean that the area processed at any time is relatively small and so the time taken to process a surface is relatively
25 long. Further, the use of these discs can lead to an uneven surface unless extreme care and thus time are taken. Also, it is very difficult to use these discs without scuffing the surface which leads to extra time being spent repairing the surface.

It is also known for surface finishing machines to have a dust collection system. These have essentially a chassis about a mounted disc about which a partial
30 vacuum is created for conducting dust to a collection vessel.

It is also known that finishing pads may take shapes other than circular or disc like.

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It is a proposed object of this invention to provide a surface finishing pad with multiple finishing areas, a surface finishing pad with an aperture therethrough for dust extraction, a mounting plate with multiple mounting areas for mounting surface finishing pads, and a surface finishing machine to obviate or minimise at least one of the aforementioned problems, or at least provide the public with a useful choice.

SUMMARY OF THE INVENTION

The invention may be said to reside, not necessarily in the broadest or only form, in a surface finishing pad adapted for mounting to a mounting plate, the surface finishing pad including a dust extraction aperture therethrough and said dust extraction aperture being adapted to align with a vacuum port of a mounting plate.

In a preferred form the surface finishing pad is a disc. In other forms the surface finishing pad may take other shapes such as rectangular.

The invention may also be said to reside, again not necessarily in the broadest or only form, in surface finishing pad including at least one dust extraction aperture therethrough, a plurality of finishing areas proud of an intervening web, the surface finishing pad being mountable to a mounting plate having at least one vacuum port with which the dust extraction aperture or dust extraction apertures are adapted to align, and the surface finishing pad being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the dust extraction aperture or dust extraction apertures by vacuum dust extraction means.

In one form the surface finishing pad is circular and adapted to be mountable to a mounting plate driven by a random orbital means.

In another form the dust extraction aperture or at least one of the dust extraction apertures is within the web. In yet another form the dust extraction aperture or at least one of the dust extraction apertures is within a one of the finishing areas.

In one form the finishing areas are radially spaced about the centre of the surface finishing pad.

The invention may also be said to reside, again not necessarily in the broadest or only form, in a mounting plate for a surface finishing machine including at least one vacuum port, a plurality of mounting areas proud of an intervening web and adapted to have mounted thereto surface finishing pads, and the mounting plate

being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the vacuum port or vacuum ports by vacuum dust extraction means.

According to one form, the mounting plate is disc like.

- 5 In another form the mounting areas are circular and adapted to receive mounted thereto surface finishing pads. These surface finishing pads or discs may take known forms.

- In one form the mounting plate has therethrough a vacuum port within the web portion for communication with dust extraction means adapted to extract dust from the web portion. In another form the mounting plate has therethrough a vacuum port within one of the mounting areas for communication with dust extraction means adapted to have mounted thereto a surface finishing pad with an aperture therethrough adapted to align with the vacuum port and thereby being adapted to extract dust from the vicinity of the said mounting area. In yet a further form, the mounting plate has channels within at least one of the mounting areas extending from the web portion and adapted to conduct dust from the vicinity of the said mounting area to the web portion for extraction therefrom.
- 10
- 15

In one form the mounting areas are radially spaced about the centre of the mounting plate.

- 20 The invention may also be said to reside in a surface finishing machine including either the before mentioned surface finishing pad or the before mentioned mounting plate and random orbital drive means adapted to drive the surface finishing pad or mounting plate.

- In one form the machine includes vacuum port means and connection means adapted to facilitate vacuum dust extraction.
- 25

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in the understanding of the invention preferred embodiments will now be described with reference to the accompanying drawings:

- Figure 1 is a perspective sketch of a surface finishing machine;
- 30 Figure 2 is a sketch of a handle for the top of the machine shown in figure 1;

- Figure 3 is a perspective sketch in cut away form of the machine with motor not drawn;
- Figure 4 is a cross sectional sketch of the machine with the motor not drawn;
- 5 Figure 5 is a perspective sketch in cut away form of the chassis;
- Figure 6 is a disassembled view of the transmission train from motor boss to base plate;
- Figure 7 is a cross sectional view of the fibre board disc;
- Figure 8 is a sketch of a perspective view of the fibre board disc;
- 10 Figure 9 is a perspective sketch of the mounting plate;
- Figure 10 is a plan view of the mounting plate;
- Figure 11 is a line sketch of a perspective view of a mounting area;
- Figure 12 is a perspective sketch of a second embodiment of the mounting plate viewed from beneath;
- 15 Figure 13 is a perspective sketch of a third embodiment of the mounting plate viewed from beneath;
- Figure 14 is a sketch of the disassembled view of a second embodiment of a surface finishing machine;
- Figure 15 is a plan view sketch of a fibre board disc;
- 20 Figure 16 is a perspective view sketch of the fibre board disc shown in figure 15;
- Figure 17 is a sketch of the central peg shown in figure 15;
- Figure 18 is a plan view sketch of a mounting plate;
- Figure 19 is a side view sketch of the mounting plate shown in figure 18;
- 25 Figure 20 is a perspective view sketch of the mounting plate shown in figure 18;

- Figure 21 is a plan view sketch of a base plate including counter weights;
- Figure 22 is a perspective view sketch of the base plate shown in figure 21;
- 5 Figure 23 is a perspective sketch of a further embodiment of a surface finishing pad viewed from beneath;
- Figure 24 is a sketch of a mounting plate and a surface finishing pad with two pairs of vacuum ports and dust extraction apertures;
- 10 Figure 25 is a sketch of under view of a surface finishing machine having a generally rectilinear configuration;
- Figure 26 is a perspective sketch of a further embodiment of a surface finishing pad viewed from beneath; and,
- 15 Figure 27 is a perspective view sketch of a further embodiment of a mounting plate adapted to mount three surface finishing pads.

DETAILED DESCRIPTION OF THE INVENTION

- It will be appreciated that the accompanying drawings are sketches and not engineering design drawings. The intention is to assist understanding of the invention and so perspective or features may be distorted or omitted for clarity. Throughout the drawings the same reference numeral will be used to refer to the same or similar feature.
- 20

The surface finishing machine depicted in the figures is of configuration for finishing a bench top.

- 25 The machine (1) has a chassis (2) upon which is mounted a 550 W electric motor (3) which operates at 1450 rpm. Extending from the chassis is a side handle (4) with a vacuum connection (5) at one end for connection with a vacuum dust extraction system.

- 30 The side handle is tubular and provides a conduit from within and beneath the chassis to the vacuum system. The side handle is mounted by a mating flange (6) and bolts to the chassis. Whilst only one connection to the extraction system is

shown for this embodiment a number may be provided if desired. For example a plurality of radially spaced apertures within the chassis may be provided and connected by hosing to a single hose which leads to the external vacuum extraction system.

- 5 Further, for some applications such as buffing the external vacuum extraction system may, as a matter of preference be disconnected.

Also extending from the chassis are two legs (7 and 8) by which the machine may be rested in an upright configuration upon a flat surface thereby allowing access to the mounting plate for surface finishing pad changing.

- 10 The machine has an overall width of about 400 mm and can finish about a 360 mm wide portion of a surface at one time. The large width means that a surface can be finished more quickly than when using prior known machines. Further, the width reduces the tendency of unevenness in the finished surface so reducing the time needed to ensure levelness. The weight of the machine is about 25 Kg
15 which means that the weight of the machine is sufficient to press the surface finishing pads against the surface for correct operation. There is no needed for an operator to press the machine against the surface and therefore the risk of scuffing is significantly reduced.

- 20 The chassis is made of aluminium and is shaped to fit about and skirt the mounting plate and attached mechanism leaving the discs extending beyond the chassis. In this way the chassis forms a shroud that facilitates dust collection and extraction. Subtending from the lower rim of the chassis is a rubber skirt (9) which makes a partial seal with a surface during operation.

- A variation to the just mentioned machine includes a top handle (10) which has a
25 push button (11) on/off switch with which to control the operational state of the electric motor. It will be appreciated that the wiring is not shown but would take known forms apparent to a skilled addressee. The handle includes a moulded hand grip (12) made of resilient material to reduce vibration transmitted to an operator. The top handle is mounted to the top of the motor by arcuate flanges
30 (13 and 14) which mount to the cylindrical side of the motor.

Within the chassis is a mounting plate (15) which is mounted to a foam rubber disc (16) which in turn is mounted to a fibre board disc (17). The rubber disc is about 7 mm thick and provides a resilient backing for the mounting plate whilst the fibre board disc is about 9 mm thick and provides a rigid support therefor.

The base plate is mounted by bearing centre (19), bearing (20), bearing retainer (21), spacer (22) to main plate (23). The base plate, bearing centre, bearing, bearing retainer and spacer are offset from the centre of the main plate by 10 mm to one side. To the lower surface of the main plate is mounted a crescent shaped counter weight (24), of mass and dimensions to counter balance the offset suspended assembly of base plate and mounting plate and associated parts. The main plate is mounted to the rotor of the motor by boss (25).

From the above it will be appreciated that the electric motor drives the main plate at 1450 rpm under normal conditions. The offset mounting of the base plate means that it and its suspended parts orbit the main plate by an eccentric motion of 20 mm from circular. This motion together with the bearing means that the base plate and the suspended parts rotate in a random orbital manner depending upon the surface and experienced load. This arrangement effects an orbital drive means for the mounting plate.

The mounting plate is made of urethane, approximately 6 mm thick and is resiliently flexible. It has four radially spaced finishing pad mounting areas (one shown as 29) spaced about its centre each 180 mm in diameter. The pad mounting areas are circular in shape and adapted to have mounted thereto by use of hook and loop means fastener, as commonly known under the trade mark VELCRO, surface finishing pads. The pad mounting areas are proud of the mounting plate by 3 mm interspaced by web portions (30) which are approximately 3 mm thick. Within the mounting areas are channels (one shown as 31) 1 mm deep between the vacuum port and the web portion for conducting

dust either to the vacuum port through the mounting areas or to the intervening web portion and thence to a vacuum port therein. The vacuum port within the mounting areas are in this embodiment proximal to the perimeter of the mounting plate where centrifugal force will tend to move dust. The channels are
5 approximately 10 mm wide and are arcuate in profile. Other profiles and widths may be used as desired whilst meeting the object of clearing the dust.

A second embodiment of the mounting plate is illustrated in figure 12. This mounting plate is of similar construction as that shown in figure 9, except that no channels are provided. The vacuum port within the mounting area is positioned
10 further away from the periphery of the mounting area, than that shown for the first embodiment. This is preferred to alleviate the problem of the sanding discs lifting at about that area as a result of the lack of sufficient surface adhesion. This embodiment of the mounting plate is useful where sanding discs are to be attached to the mounting plate by the use of an adhesive rather than VELCRO
15 (trade mark). Sanding discs used in the first embodiment tend to conform to the shape of the mounting area under the influence of the vacuum, however certain sanding pads currently on the market are particularly rigid and will not do so. The second embodiment of the mounting plate can then be used.

A third embodiment of the mounting plate is illustrated in figure 13. This mounting plate is very similar in construction to the mounting plate shown in figure 9. The primary differences are that there are less channels, and that the vacuum port within the pad mounting area is positioned further away from the periphery of the pad mounting area. These modifications are preferred where there are difficulties in providing sufficient adhesion for the pad to stay on the
20 mounting plate during use.

The mounting plate is secured to the fibre board disc by means of radially spaced bolts. This mounting is not shown in all figures but takes a form apparent to a skilled addressee. Discussion concerning another embodiment of a surface finishing machine below mentions and depicts the bolts. In this first embodiment
30 the foam rubber disc has appropriate apertures and is secured in place by the bolts securing the mounting plate to the fibre board disc.

To the mounting areas may be mounted modified standard 180 mm (6 inch) discs that are commonly available within Australia and in at least some overseas countries. These discs, it is intended, will be available with an aperture
35 therethrough to align with the vacuum port within the mounting area.

Alternatively, it is a relatively simple matter to cut a suitable aperture through a prior known disc. Such apertures are not required with polishing or buffing discs where dust is not created to any serious extent.

The second embodiment of the surface finishing machine will now be discussed.

- 5 The machine is similar to the first and also includes an electric motor, suitable controls, handles and vacuum extraction system. The differences lie within the chassis and these will be discussed.

To the rotor of the motor is mounted a boss (32). There is a spacer (33), bearing retainer (34), bearing (35), bearing centre (36) and main plate (37) which
10 collectively mount the main plate to the boss using bolts (one shown as 38). This is generally as previously described.

The main plate, again made of steel, takes a different shape being best seen in figure 21 and is not a circular disc. The weight of the main plate is accordingly reduced. To the main plate is mounted by bolts two counter weights (39 and 40)
15 each being fasten to opposite sides of the main plate. A further countering weight is provided by counter balance (41) which is also bolted to the main plate. It will be appreciated that the function of the main plate is as before and is part of an orbital drive means.

Mounted by bolts to the main plate is a base plate (42) which again is made of
20 steel. The base plate is essentially as previously described and is mounted off centre with respect to the main plate to effect the random orbital motion.

Mounted by bolts to the base plate is a fibre board disc (43) which in plan view is not circular. Its shape is best seen in figure 15. It is 9 mm thick and quite rigid so providing a firm backing to a mounting plate later to be described. Glued to the
25 fibre board disc are four mounting area pegs (one shown as 44) and a central peg (45) all made of P.V.C. cylindrical tubing approximately 33 mm in diameter. These pegs provided registering means for the mounting plate and conduits for the vacuum ports through which dust may be extracted.

The central peg has an external circumferential groove (46) of approximately 0.5
30 mm depth and 2 mm width. This groove is located so that it is approximately level with but slightly spaced from the surface (47) from which the pegs project. This groove forms part of a fastening means for securing the mounting plate to the fibre board disc.

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The mounting plate (48) is of layer construction having a first layer (49) of urethane approximately 6 mm thick, a second layer (50) of foam rubber of approximately 9 mm thickness, and a final layer being a P.V.C. backing plate (51) of approximately 1 mm thickness. These layers are glued together to make a laminated structure.

The foam rubber layer is equivalent to the foam rubber disc of the first embodiment. Likewise with the first layer and the mounting plate of the first embodiment. It will be appreciated that the laminated construction simplifies assembly and disassembly but functionally is the same as the separate components of the first embodiment.

All the layers of the mounting plate include holes to receive the pegs projecting from the fibre board disc. The hole of the backing plate to receive the central peg is slightly smaller than the diameter of the peg, approximately 32 mm compared with approximately 33 mm, so forming a circular detent (52). The backing plate is sufficiently resilient to flex under manual pressure of fitting the mounting plate to allow the central peg to be received and when against the fibre board disc the backing plate clicks into the groove. This prevents unintentional separation of the fibre board disc and the mounting plate whilst allowing easy fitting. The four mounting area pegs register the mounting plate relative to the fibre board disc. The backing plate is also flexible enough to allow for intentional removal of the mounting plate by an operator.

Being able to change the mounting plate allows a number of mounting plates to be prepared and interchanged as required before requiring new surface finishing pads to be fitted. Also, changing mounting plates permits changing from one grade of finishing pad to another including going from sanding to buffing.

Through the mounting plate are vacuum ports (53, 54, 55, 56 and 57) defined by the pegs. There are also four mounting areas (one shown as 58) to which a surface finishing pad (one shown as 59) can be mounted.

Depending upon the application and whether dust is created, the surface finishing pad has a dust extraction aperture (60). The dust extraction aperture aligns with the vacuum port within the respective mounting area. The surface finishing pad may be a modified previously known and commercially available surface finishing pad, the modification being the cutting of the dust extraction aperture.

It will be appreciated that each mounting area (one shown as 61) of a mounting plate (62) and respective surface finishing pad (63) may have multiple aligned vacuum port (two shown as 64 and 65) and dust extraction apertures (two shown as 66 and 67) as illustrated in figure 24.

- 5 Whilst circular surface finishing pads have been described it will be appreciated that the arrangement may be altered to accept rectangular surface finishing pads (68). In this form the surface finishing machine has a chassis (69), fibre board disc and mounting plate (70) with a generally rectilinear configuration. This is illustrated in figure 25. The mounting areas (one shown as 71) has a vacuum port (one shown as 72) and the surface finishing pad may have a respective dust extraction aperture (73). Within the mounting plate are other vacuum ports through the web (74) interconnecting the mounting areas including rectangular ports (one shown as 75) between mounting areas.

- 15 It will be appreciated that due to currently available discs it is preferred to mount separate discs to the pad mounting areas. However, it is envisaged that discs may be made to cover the whole mounting plate whilst providing for operation as hereinbefore explained. Figure 23 illustrates a surface finishing pad (76) made of a suitable material such as urethane which would be mounted to a flat faced mounting plate through which suitable vacuum ports exist to align with the dust extraction apertures (two 20 shown as 77 and 78). The surface finishing pad has four raised surface finishing areas (one shown as 79) upon which is the finishing material. The surface finishing pad may include channels (one shown as 80) which effect the same function as the previously described channels as illustrated in figure 26.

- 25 The mounting plate (81) illustrates the use of three mounting areas (one shown as 82) with vacuum ports (two shown as 83 and 84). Apart from the number of the mounting areas and appropriate changes to the number and location of vacuum ports this configuration is essentially the same as previously described.

- 30 It will also be appreciated that with an appropriate handle, longer than that previously illustrated, the machine just described can be converted to be used for floor operation with the operator being able to stand during use.

Other variations to the just described embodiment will be apparent to the skilled addressee including the provision of mounting areas spaced about two or more

rings about the centre of the mounting plate thereby allowing a greater area to be finished at any time.

It will be appreciated that this disclosure is not intended to limit the invention to the preferred embodiment or details thereof. It is intended to give an overview of the invention as conceived and other embodiments will be apparent to the skilled addressee all of which fall within the spirit of the invention.

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CLAIMS

1. A surface finishing pad adapted for mounting to a mounting plate, the surface finishing pad including a dust extraction aperture therethrough and said dust extraction aperture being adapted to align with a vacuum port of a mounting plate.
2. A surface finishing pad as in claim 1 including more than one dust extraction aperture, each said dust extraction aperture being adapted to align with a respective vacuum port of a mounting plate.
3. A surface finishing pad as in either claim 1 or claim 2 wherein the surface finishing pad is a disc.
4. A surface finishing pad as in claim 3 wherein the diameter of the surface finishing pad is less than or equal to 203 mm.
5. A surface finishing pad as in either claim 1 or claim 2 wherein the surface finishing pad is rectangular.
6. A surface finishing pad as in any one of the preceding claims including adhesive means adapted for adhering the surface finishing pad to a mounting plate.
7. A surface finishing pad as in any one of claims 1 to 5 inclusive including hook and loop means adapted for attaching the surface finishing pad to a mounting plate.
8. A surface finishing pad as in any one of the preceding claims adapted for sanding, burnishing or polishing of timber surfaces.
9. A surface finishing pad as in any one of claims 1 to 7 inclusive adapted for sanding, burnishing or polishing of stone surfaces.
10. A surface finishing pad as in any one of claims 1 to 7 inclusive adapted for sanding, burnishing or polishing of acrylic surfaces.
11. A surface finishing pad including at least one dust extraction aperture therethrough, a plurality of finishing areas proud of an intervening web, the surface finishing pad being mountable to a mounting plate having at least one vacuum port with which the dust extraction aperture or dust extraction apertures

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are adapted to align, and the surface finishing pad being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the dust extraction aperture or dust extraction apertures by vacuum dust extraction means.

- 5 12. A surface finishing pad as in claim 11 wherein the dust extraction aperture or at least one of the dust extraction apertures is within the web.

13. A surface finishing pad as in claim 11 wherein the dust extraction aperture or at least one of the dust extraction apertures is within a one of the finishing areas.

- 10 14. A surface finishing pad as in any one of claims 11 to 13 inclusive being circular and adapted to be mountable to a mounting plate driven by a random orbital means.

15. A surface finishing pad as in any one of claims 11 to 14 inclusive wherein the centre of the surface finishing pad is part of the web.

- 15 16. A surface finishing pad as in any one of claims 11 to 15 inclusive wherein the finishing areas are radially spaced about the centre of the surface finishing pad.

17. A surface finishing pad as in claim 16 including at least three finishing areas.

- 20 18. A surface finishing pad as in claim 16 including four finishing areas.

19. A surface finishing pad as in any one of claims 15 to 18 inclusive including a plurality of dust extraction apertures, at least one dust extraction aperture being through the web and proximal to the centre of the surface finishing pad, and other dust extraction apertures being through the web and proximal to
25 the periphery of the surface finishing pad.

20. A surface finishing pad as in any one of claims 15 to 19 inclusive including a plurality of dust extraction apertures, at least one dust extraction aperture being through each finishing area.

- 30 21. A surface finishing pad as in claim 20 wherein the finishing areas are circular and the dust extraction aperture of each finishing area being between the centre of the respective finishing area and the periphery of the respective finishing area distal the centre of the surface finishing pad.

15

22. A surface finishing pad as in any one of claims 11 to 20 inclusive wherein each finishing area has at least one channel therein adapted to direct dust to the dust extraction aperture or a one of the dust extraction apertures.
23. A surface finishing pad as in claim 21 wherein each finishing area has at least one channel therein adapted to direct dust to the dust extraction aperture through the respective finishing area.
24. A surface finishing pad as in any one of claims 11 to 23 inclusive wherein the finishing areas are circular and of diameter less than or equal to 203 mm.
25. A surface finishing pad as in any one of claims 11 to 24 inclusive adapted for sanding, burnishing or polishing of timber surfaces.
26. A surface finishing pad as in any one of claims 11 to 24 inclusive adapted for sanding, burnishing or polishing of stone surfaces.
27. A surface finishing pad as in any one of claims 11 to 24 inclusive adapted for sanding, burnishing or polishing of acrylic surfaces.
28. A mounting plate for a surface finishing machine including at least one vacuum port, a plurality of mounting areas proud of an intervening web and adapted to have mounted thereto surface finishing pads, and the mounting plate being adapted such that dust tends to progress into the proximity of the web and may therefrom be extracted through the vacuum port or vacuum ports by vacuum dust extraction means.
29. A mounting plate as in claim 28 wherein the vacuum port or at least one of the vacuum ports is within the web.
30. A mounting plate as in claim 28 wherein the vacuum port or at least one of the vacuum ports is within a one of the finishing areas.
31. A mounting plate as in any one of claims 28 to 30 inclusive being circular and adapted to be driven by a random orbital means.
32. A mounting plate as in any one of claims 28 to 31 inclusive wherein the centre of the mounting plate is part of the web.
33. A mounting plate as in any one of claims 28 to 32 inclusive wherein the finishing areas are radially spaced about the centre of the mounting plate.

34. A mounting plate as in claim 33 including at least three finishing areas.
35. A mounting plate as in claim 33 including four finishing areas.
36. A mounting plate as in any one of claims 32 to 35 inclusive including a plurality of vacuum ports, at least one vacuum port being through the web and proximal to the centre of the mounting plate, and other vacuum ports being through the web and proximal to the periphery of the mounting plate.
37. A mounting plate as in any one of claims 32 to 36 inclusive including a plurality of vacuum ports, at least one vacuum port being through the web and proximal to the centre of the mounting plate, other vacuum ports being through the web and proximal to the periphery of the mounting plate, and the mounting plate having respective vacuum ports with which the vacuum ports are adapted to align.
38. A mounting plate as in any one of claims 32 to 37 inclusive including a plurality of vacuum ports, at least one vacuum port being through each mounting area being adapted to align with a dust extraction aperture of a surface finishing pad.
39. A mounting plate as in claim 38 wherein the mounting areas are circular and the vacuum port of each mounting area being between the centre of the respective mounting area and the periphery of the respective mounting area distal the centre of the mounting plate.
40. A mounting plate as in any one of claims 28 to 38 inclusive wherein each mounting area has at least one channel therein adapted to direct dust to the vacuum port or a one of the vacuum ports.
41. A mounting plate as in claims 39 wherein each mounting area has at least one channel therein adapted to direct dust to the vacuum port through the respective mounting area.
42. A mounting plate as in any one of claims 28 to 41 inclusive wherein the mounting areas are circular and of diameter less than or equal to 373 mm.
43. A mounting plate as in any one of claims 28 to 42 inclusive including hook and loop means adapted for attaching a surface finishing pad to the mounting plate.

44. A mounting plate as in any one of claims 28 to 43 inclusive made from urethane.

45. A mounting plate as in any one of claims 28 to 43 inclusive comprising a plurality of layers between an external surface upon which the mounting areas lie
5 and a rear surface, and the mounting plate including a first layer including the mounting areas made of urethane and a second layer of resilient material.

46. A mounting plate as in any one of claims 28 to 45 inclusive wherein the vacuum port or at least one of the vacuum ports fits over a hollow cylindrical dust extraction peg, the dust extraction peg having an external circumferential groove,
10 and the mounting plate including a thin backing plate with a peg aperture of diameter slightly smaller than the external diameter of the peg and adapted to receive the dust extraction peg, and the thickness and resiliency of the backing plate being such that the mounting plate may be pushed onto and pulled off the dust extraction peg and when secured relative to the dust extraction peg the
15 backing plate resides within the groove.

47. A surface finishing machine including the finishing surface finishing pad of any one of claims 11 to 27 inclusive and random orbital drive means adapted to drive the surface finishing pad.

48. A surface finishing machine including the mounting plate of any one of
20 claims 28 to 46 and random orbital drive means adapted to drive the mounting plate.

49. A surface finishing machine as in either claim 47 or 48 including vacuum port means and connection means adapted to facilitate vacuum dust extraction.

50. A surface finishing machine as is claim 49 including dust collection means
25 for the collection of the extracted dust.

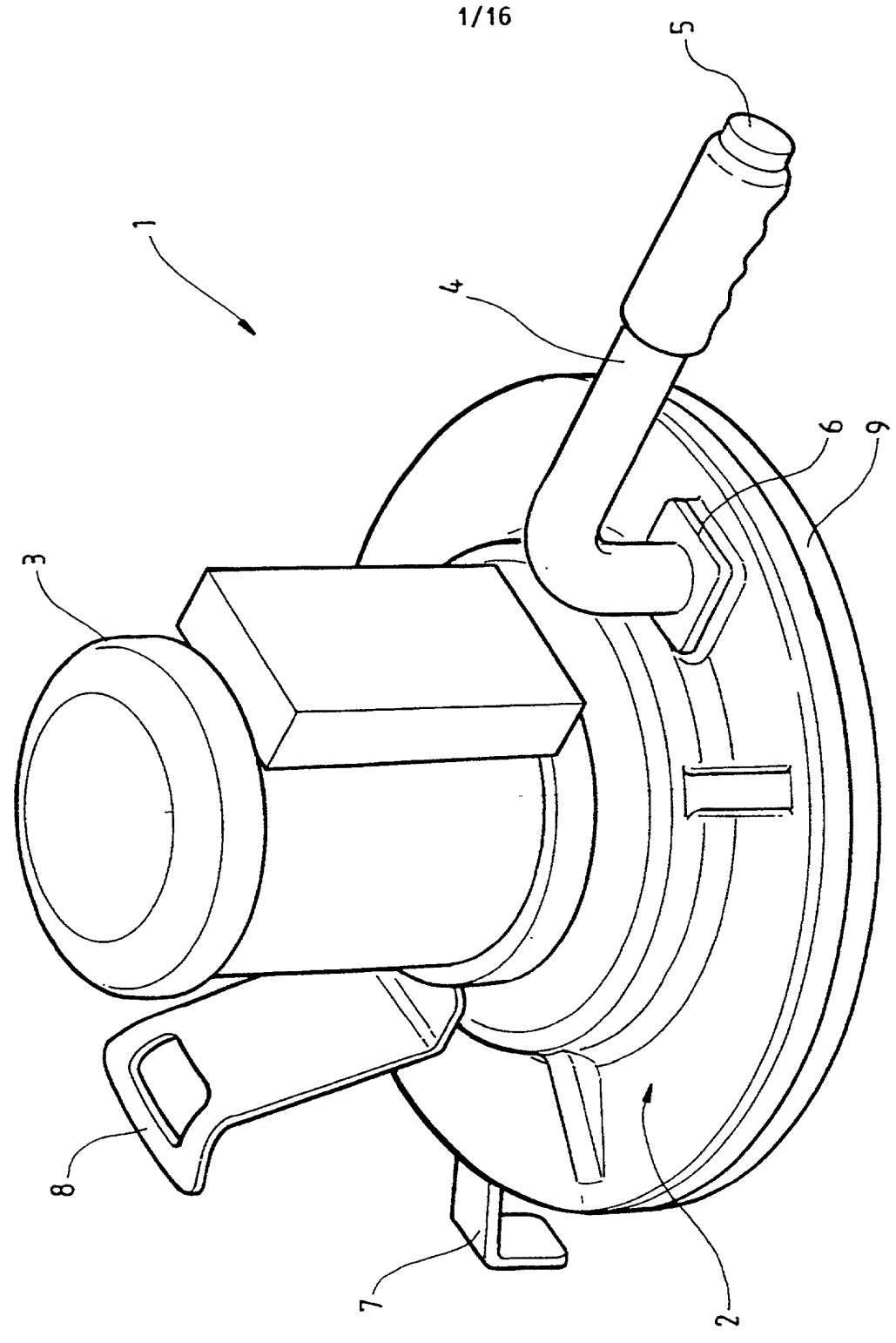
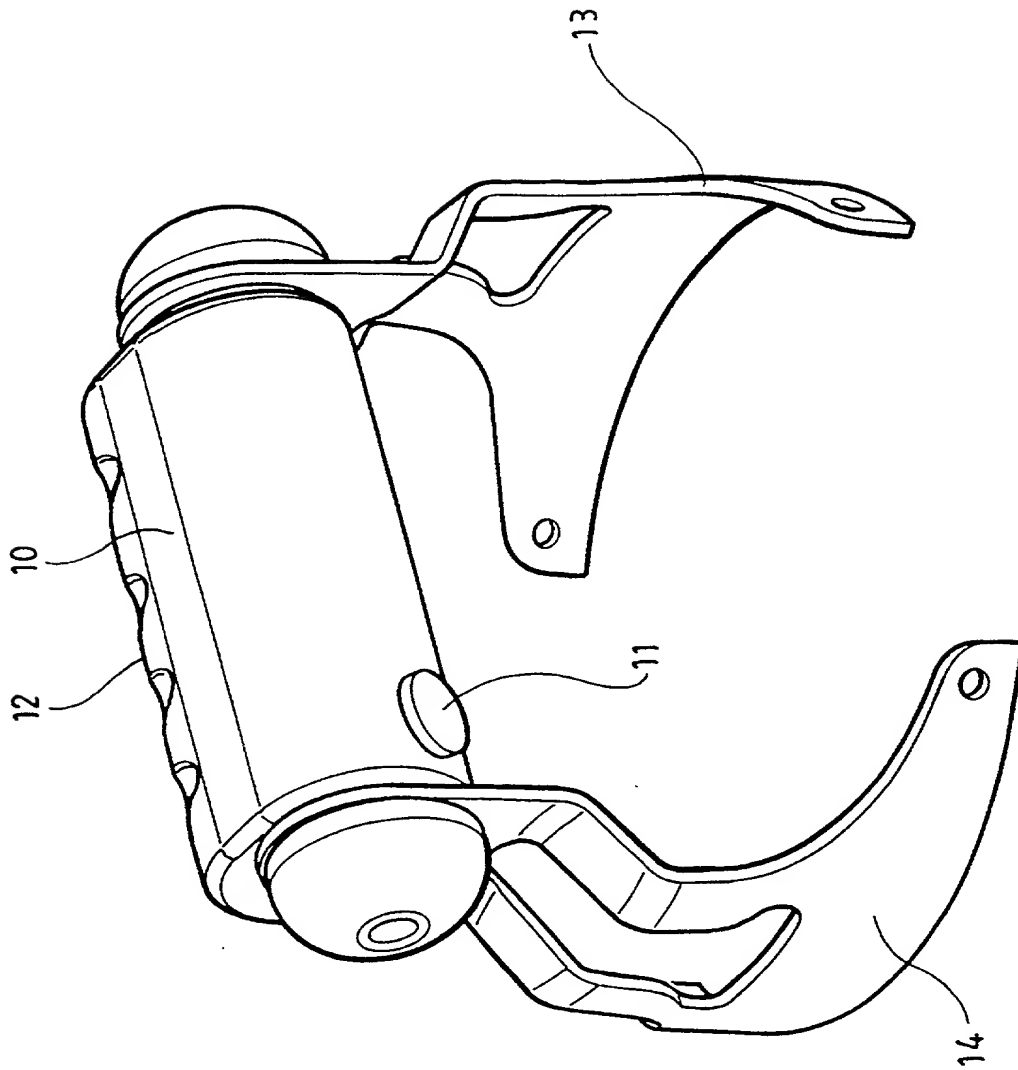
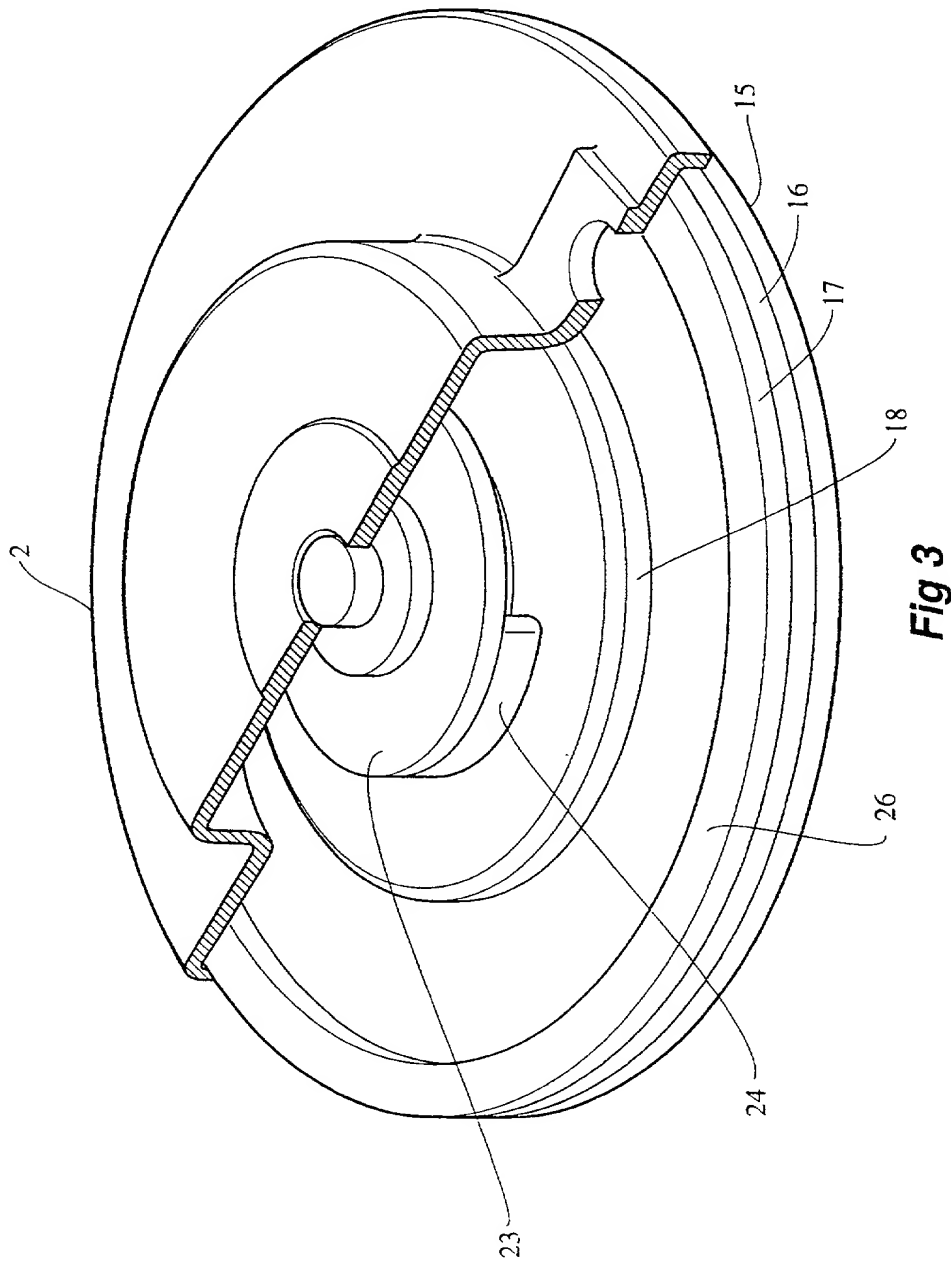
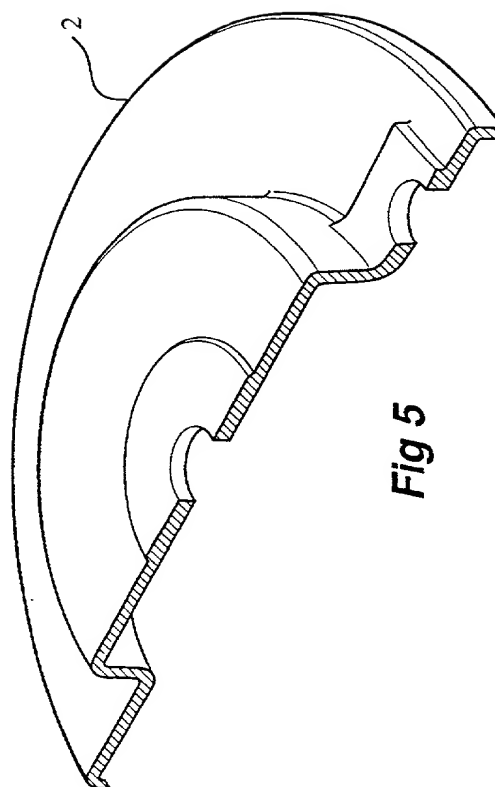
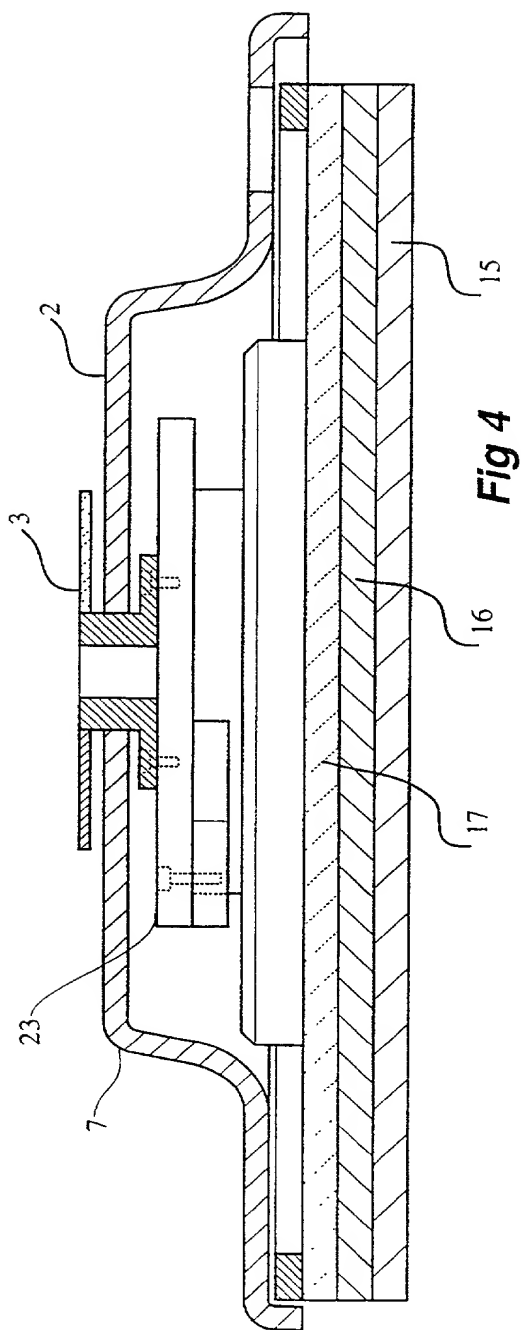


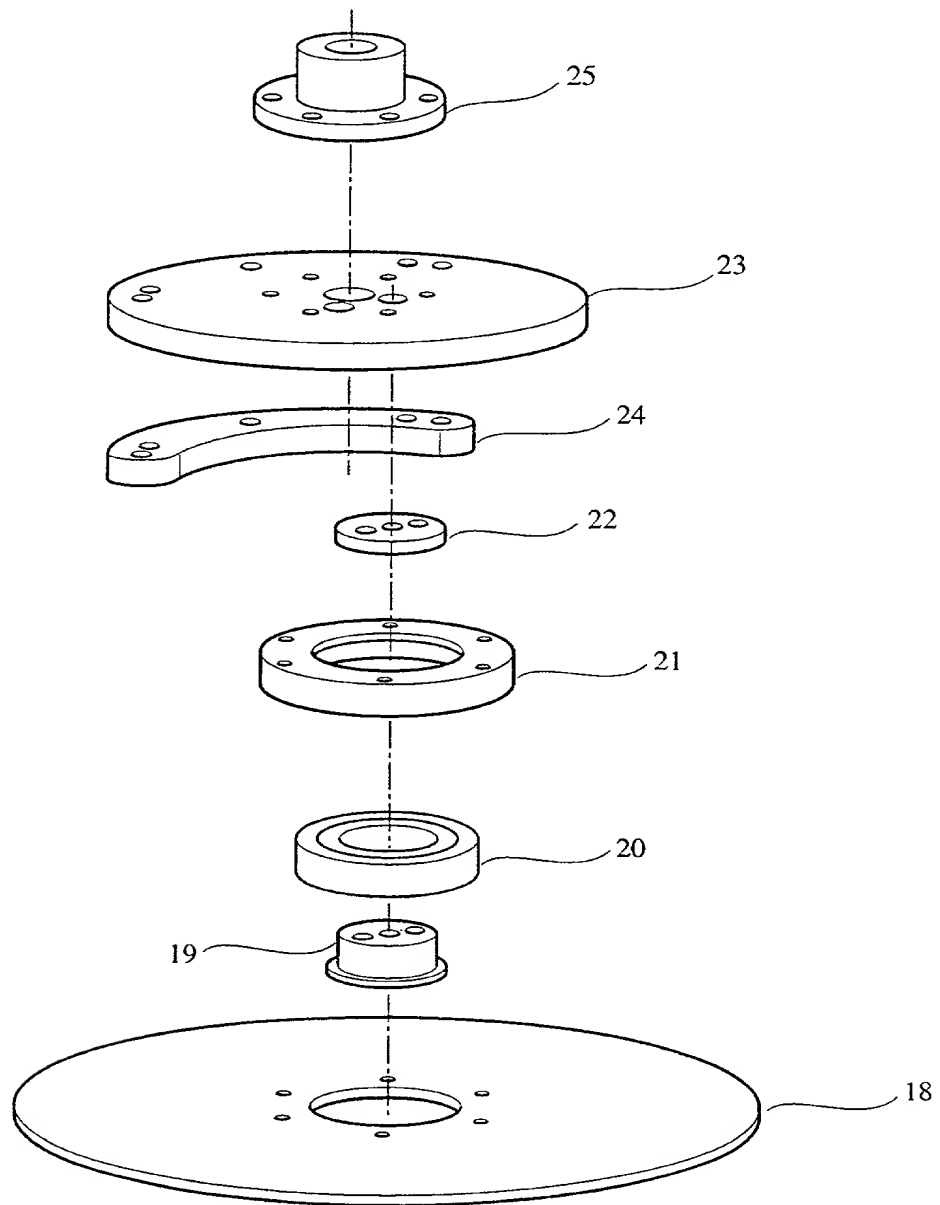
FIG 1

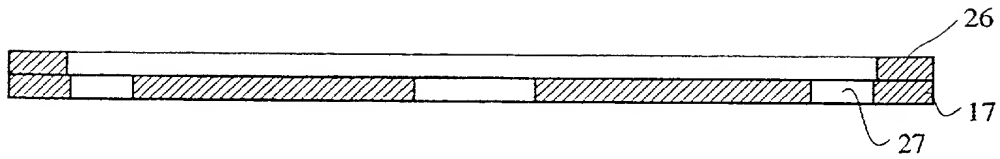
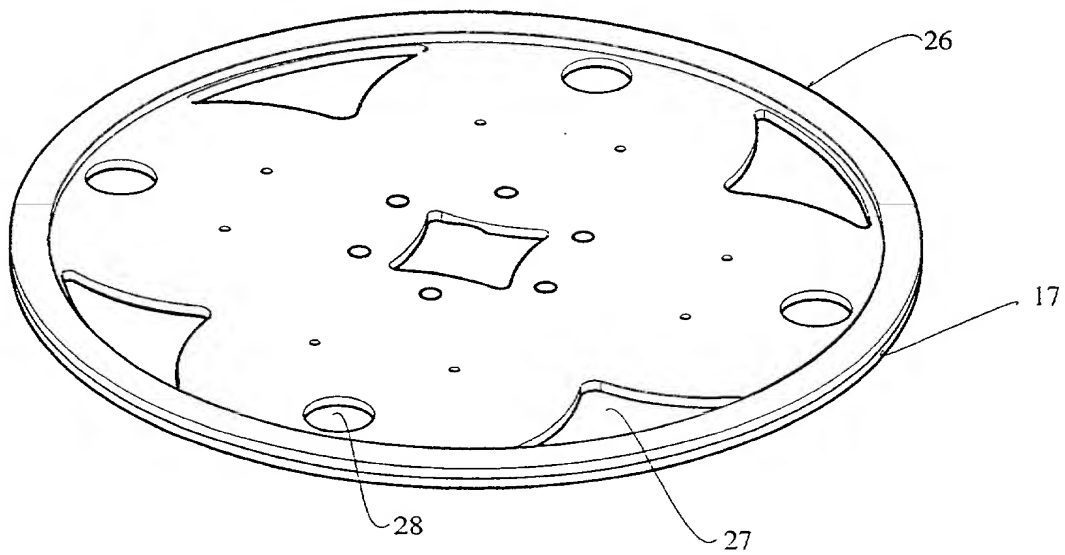
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**FIG 6**

**Fig 7****Fig 8**

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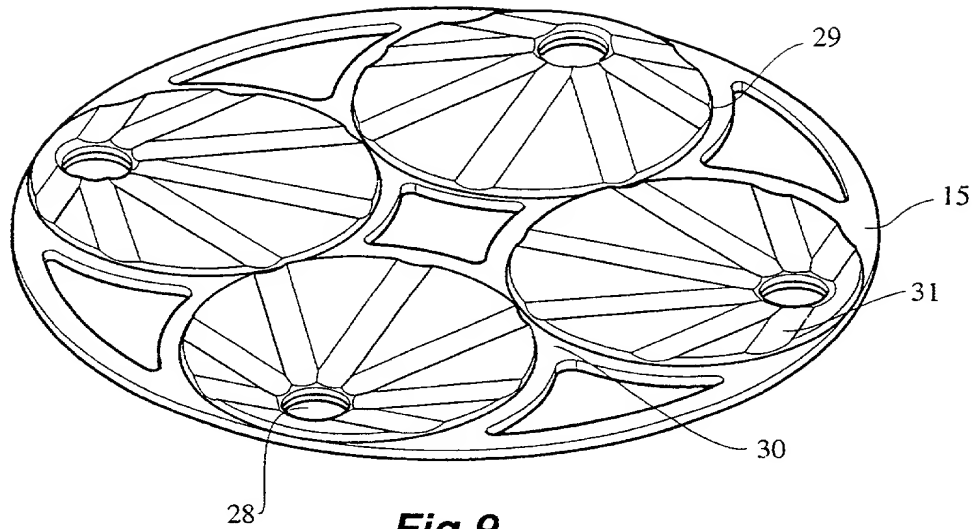


Fig 9

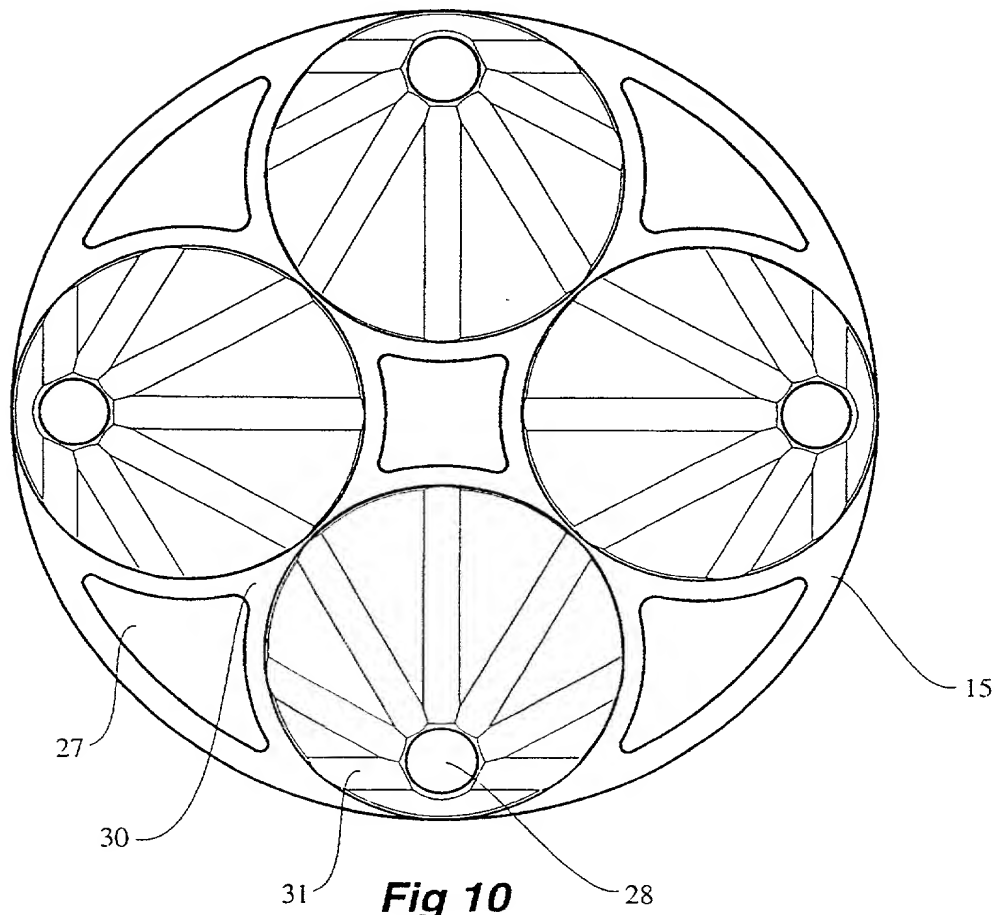


Fig 10

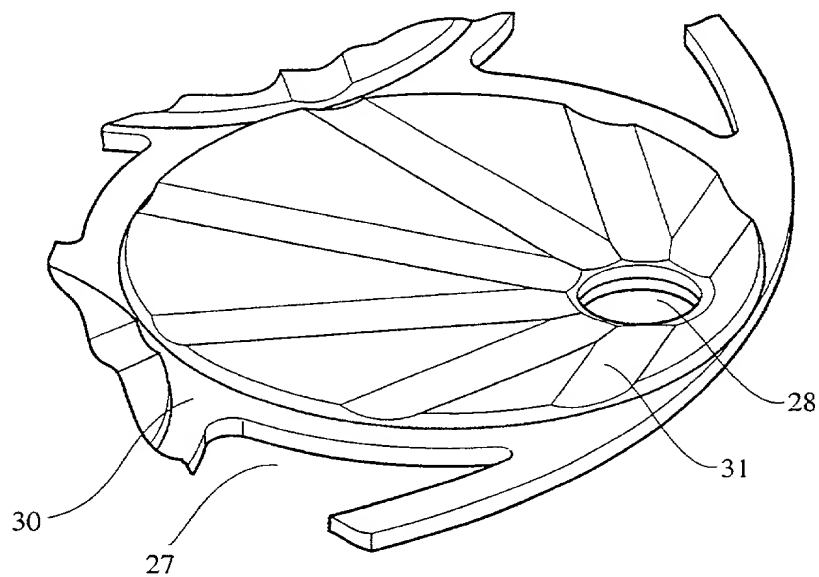


Fig 11

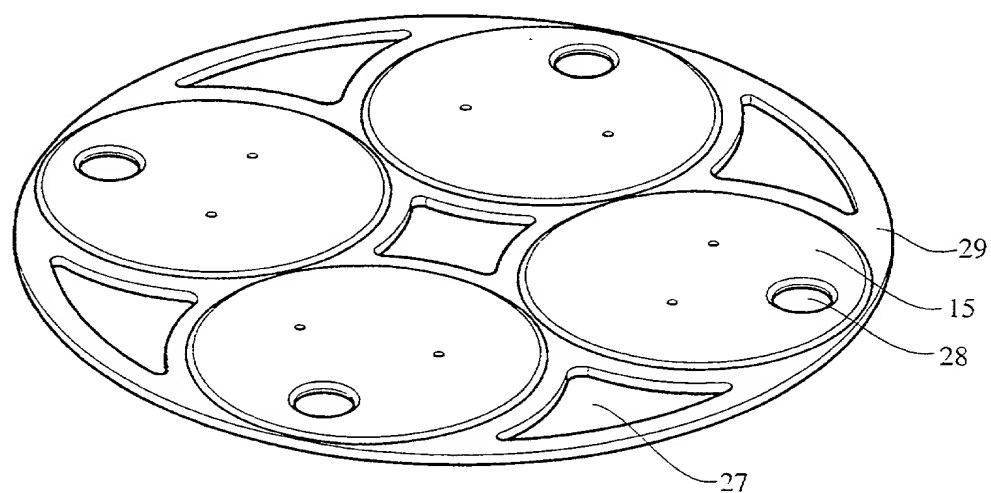
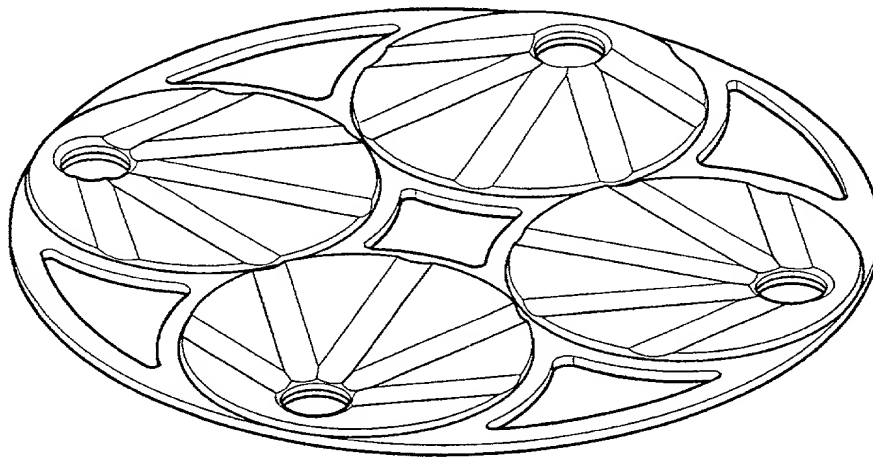
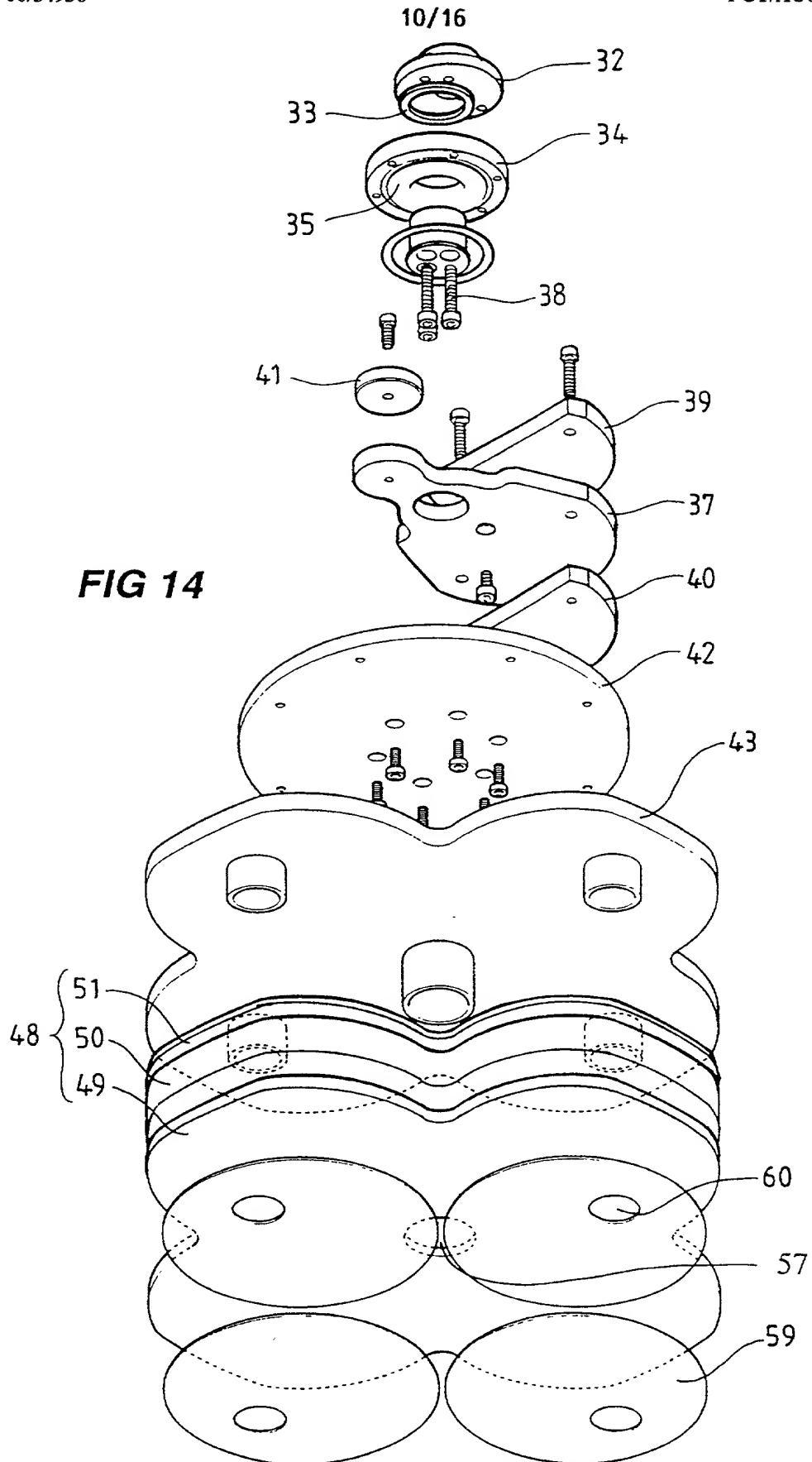


Fig 12

**Fig 13**



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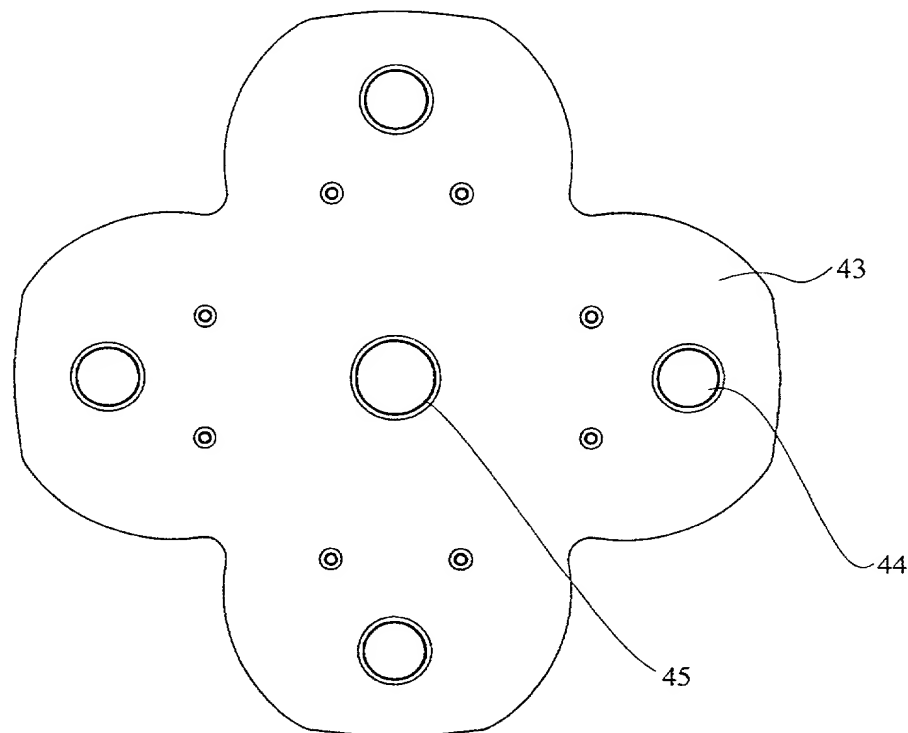


FIG 15

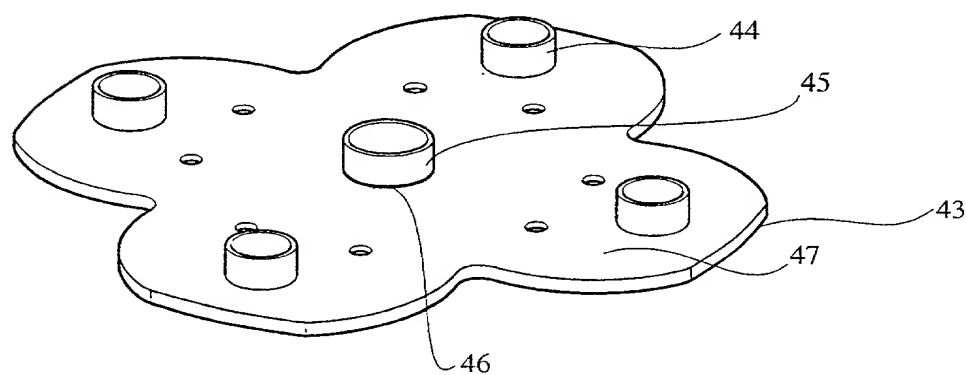


FIG 16

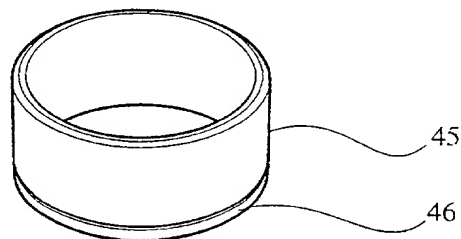
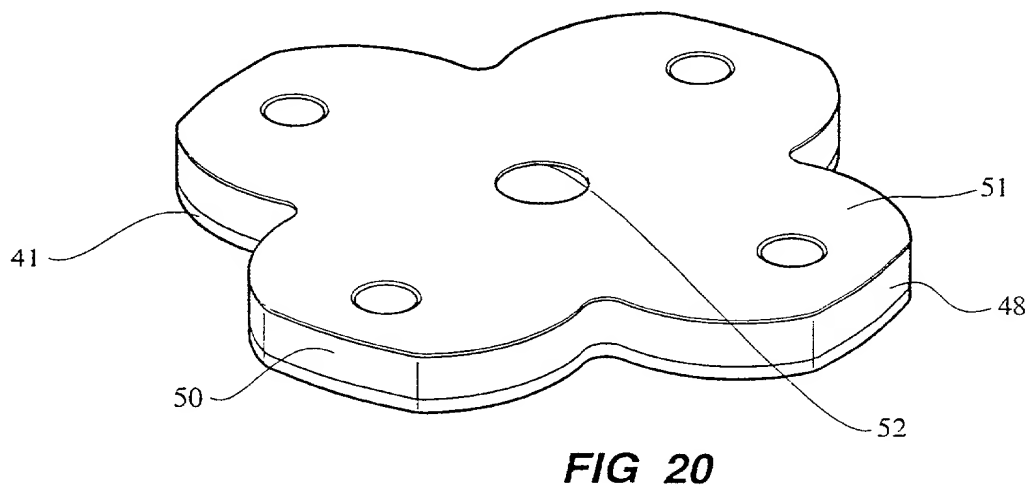
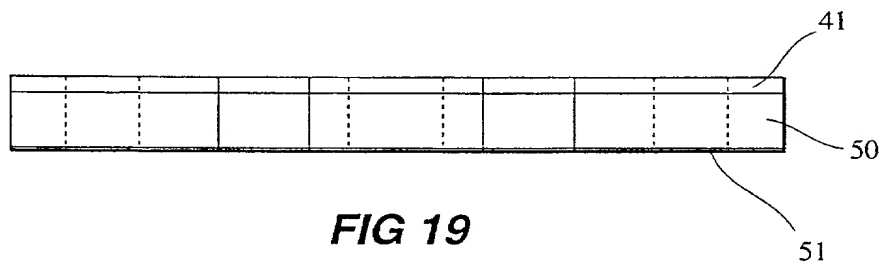
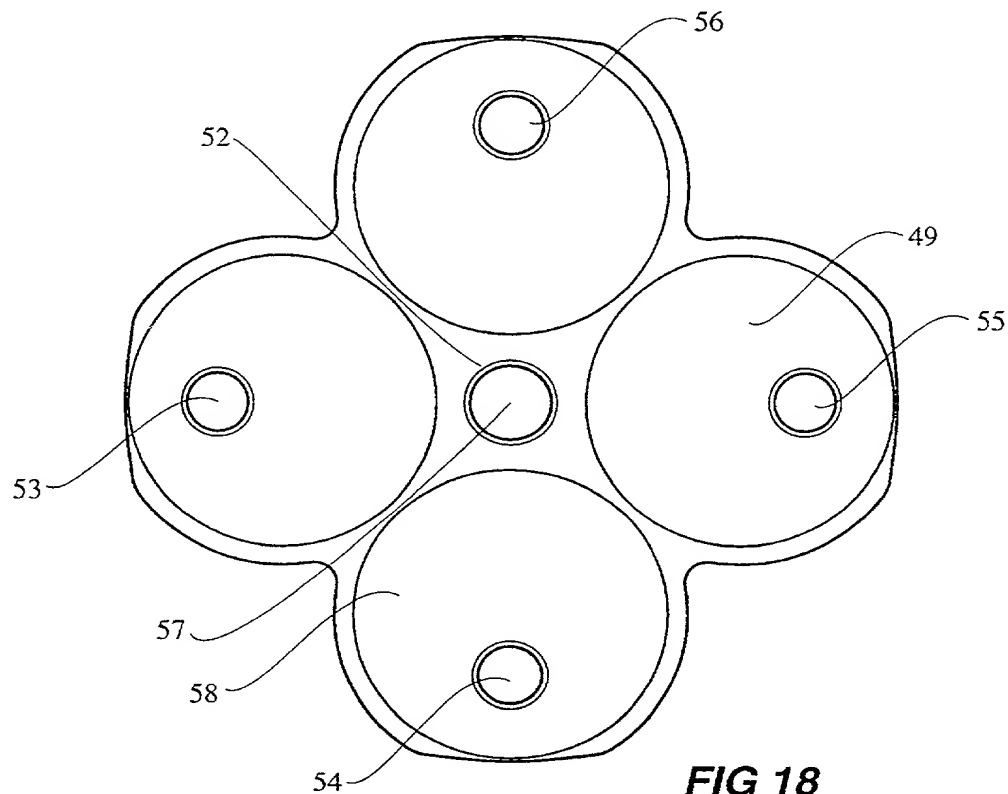


FIG 17



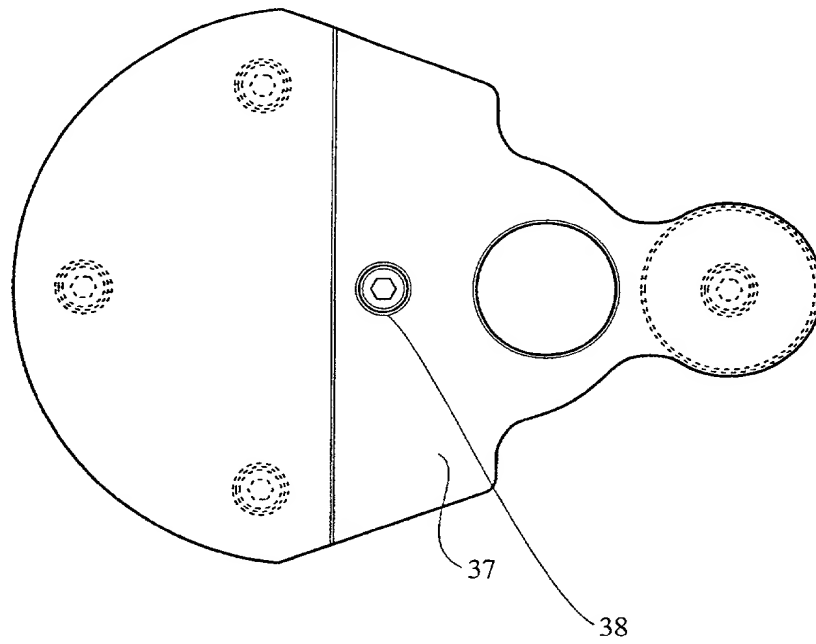


FIG 21

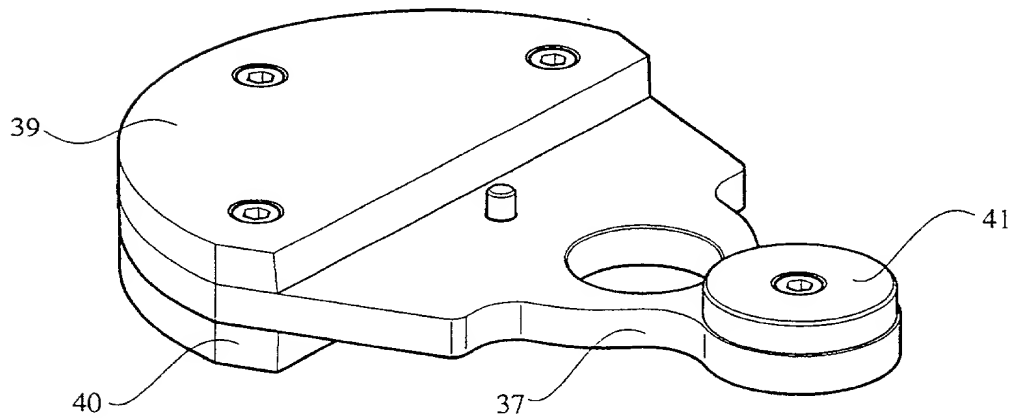
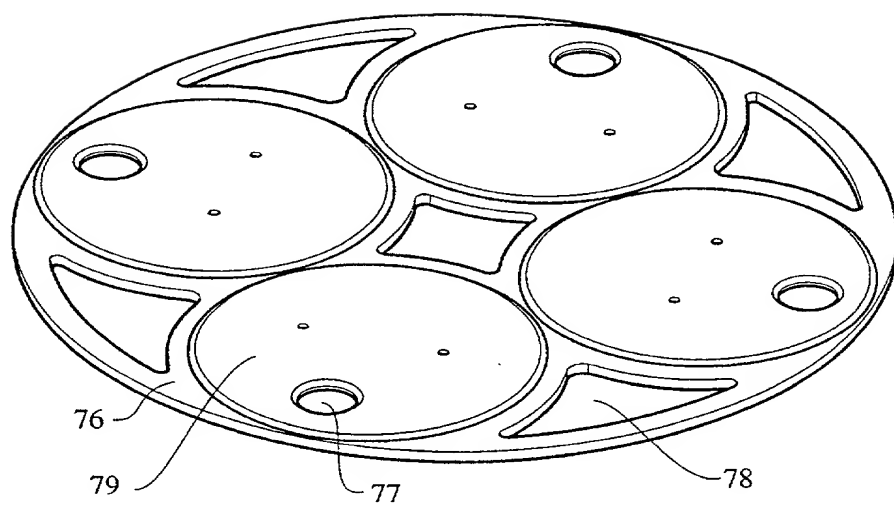


FIG 22

**Fig 23**

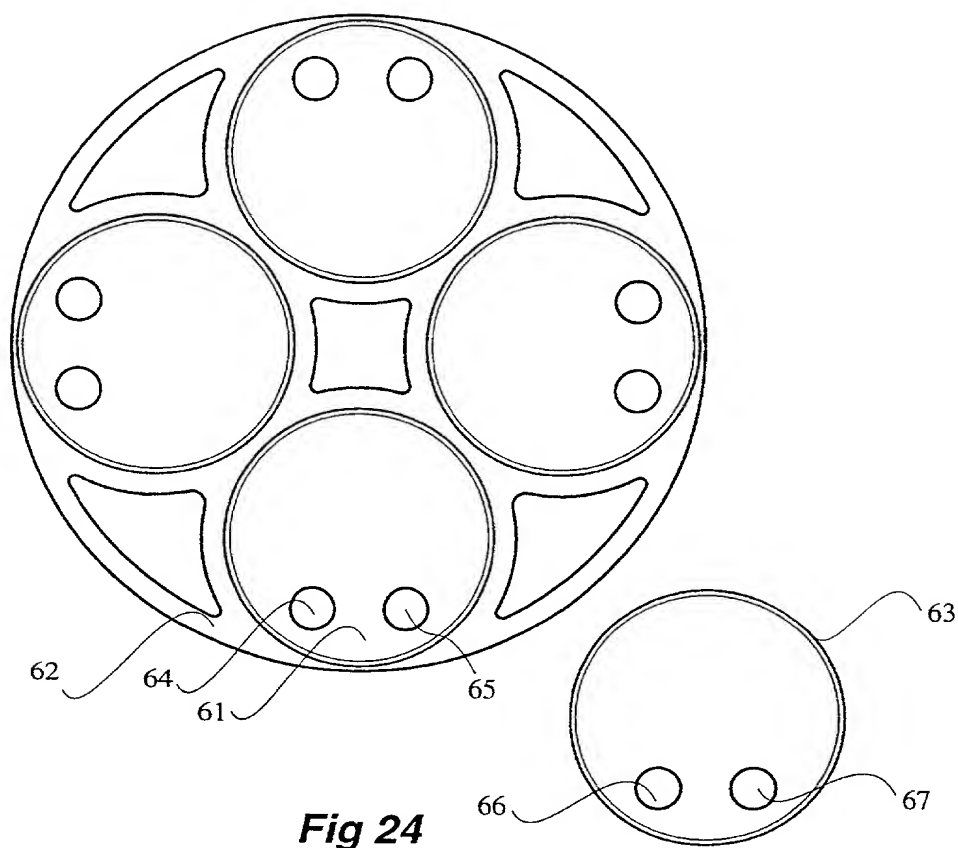


Fig 24

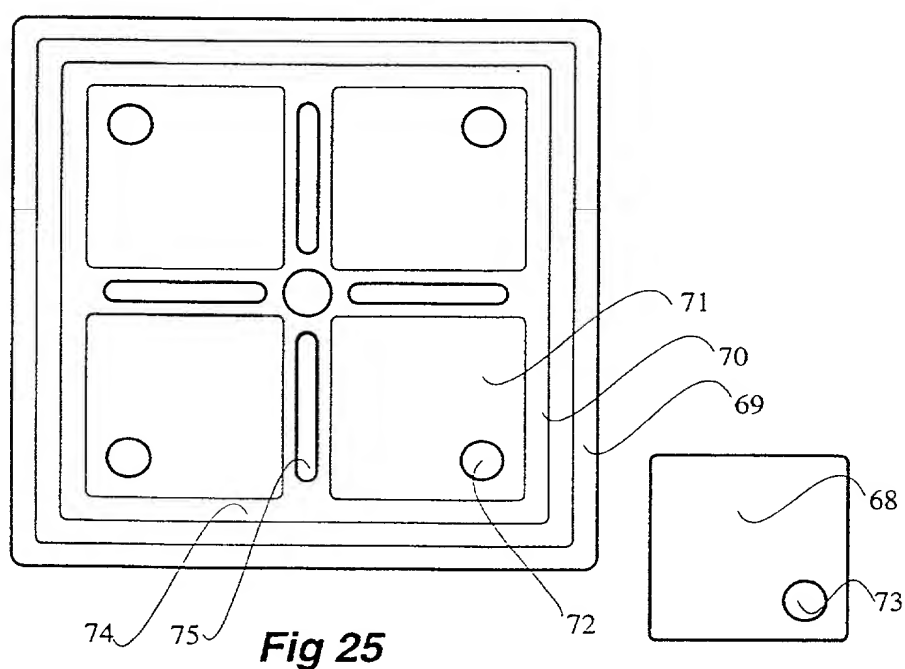
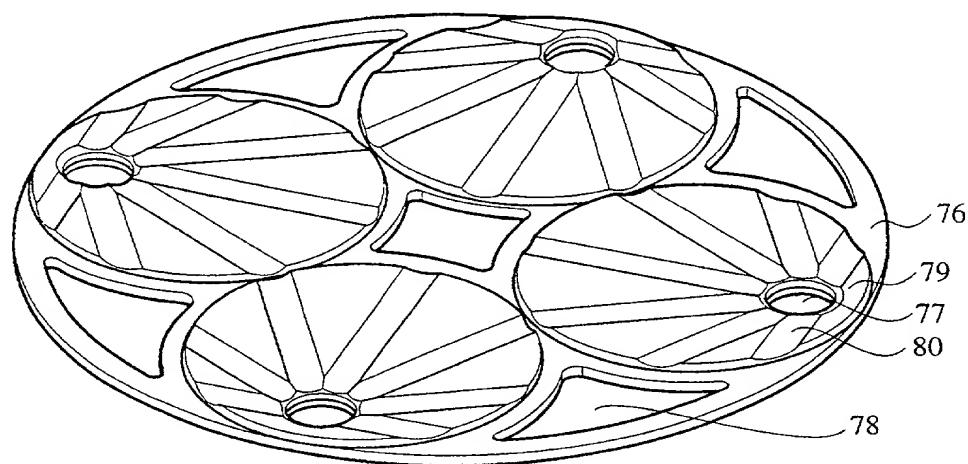
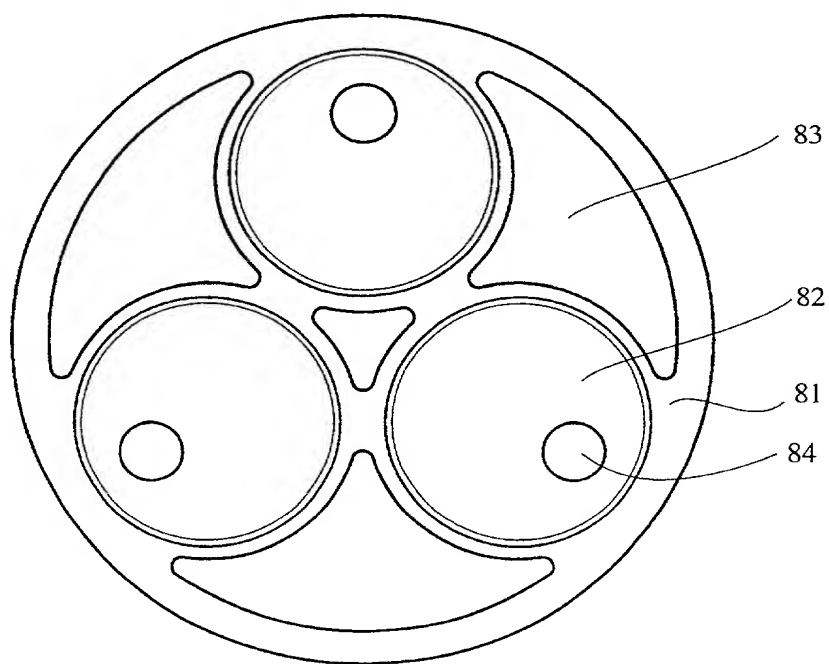


Fig 25

**Fig 26****Fig 27**

**COMBINED DECLARATION AND POWER OF ATTORNEY FOR UNITED STATES
PATENT APPLICATION**

As the below named inventors, we hereby declare that:

Our residence, post office address and citizenship are the same as stated below next to our name.

We believe we are an original, first and sole inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled:-

SURFACE FINISHING MACHINE

the specification of which

☐

is attached hereto

☒

was filed as PCT International application PCT/AU00/00212 dated 17th March 2000 and was amended on 5th April 2000 and 2nd March 2001.

We hereby state that we have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose information known to us to be material to the examination of this application in accordance with Title 37, Code of Federal Regulations, S1.56(a).

We hereby claim foreign priority benefits under Title 35, United States Code, S119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate listed below, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the applicant on which priority is claimed.

Number	Country	Filing Date (d/m/y)	Priority Claimed
PP9267	Australia	17 March 1999	<input checked="" type="checkbox"/> yes <input type="checkbox"/> no

We hereby claim the benefit under Title 35, United States Code, S120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, S112, we acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of

Federal Regulation, S1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

Application Serial No. Filing Date (d/m/y) Status (Patented, Pending, Abandoned)

We hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

3

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CONNECTICUT 06605-1601
UNITED STATES OF AMERICA

We hereby declare that all statements made herein of our own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Residence: 21 Shepherd Street, Ridgehaven, South Australia 5097, Australia

Post Office Address: as above

Country of Citizenship AUSTRALIA

Date

3/9/01

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Post Office Address: as above

AUX

Country of Citizenship AUSTRALIA

3/9/01
Date

Susan McNair
SUSAN GAIL MCNAIR

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